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Railway Congress Association
(English Edition)

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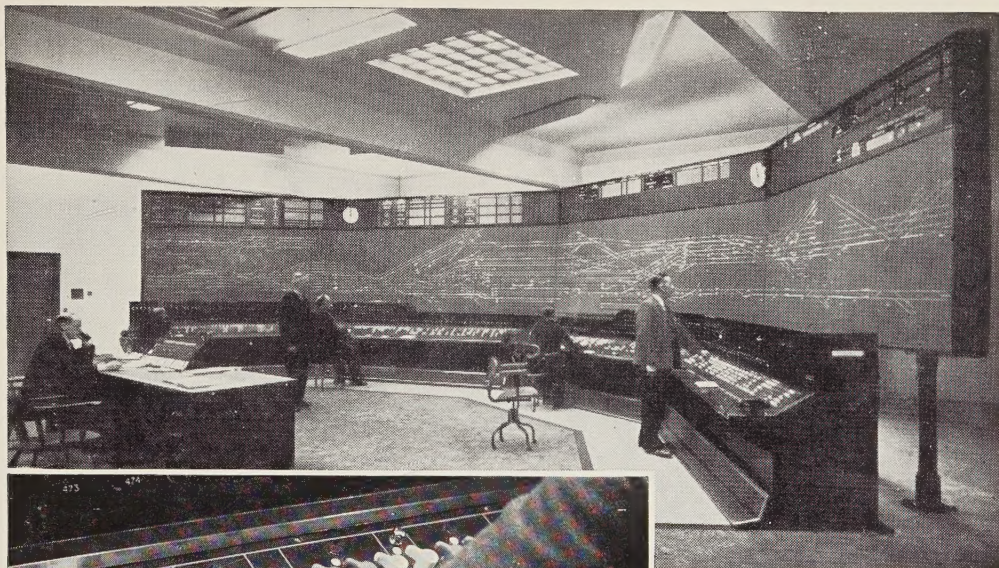
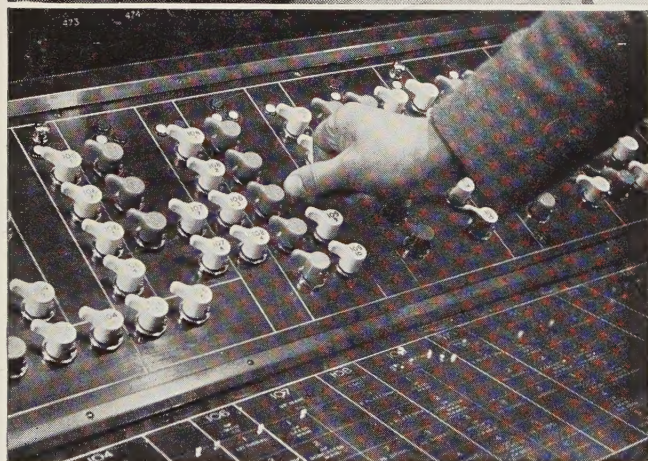


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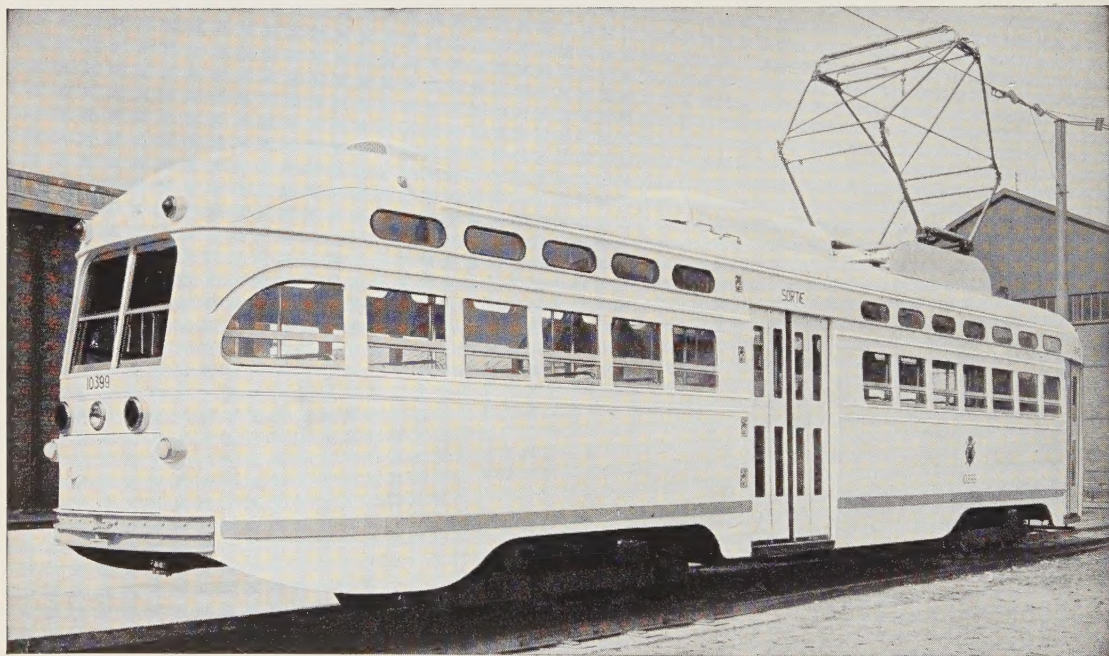
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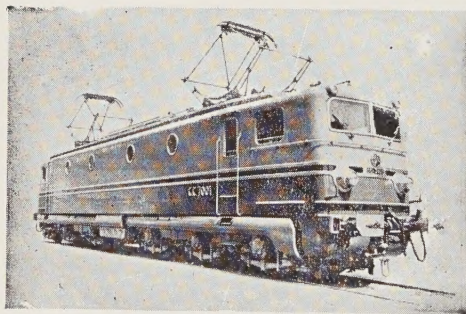
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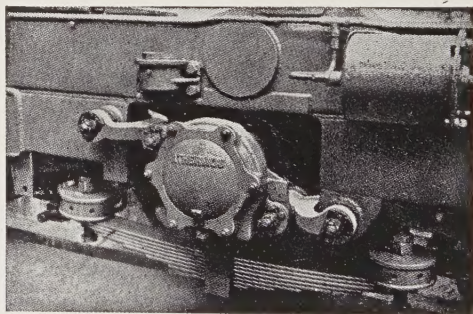
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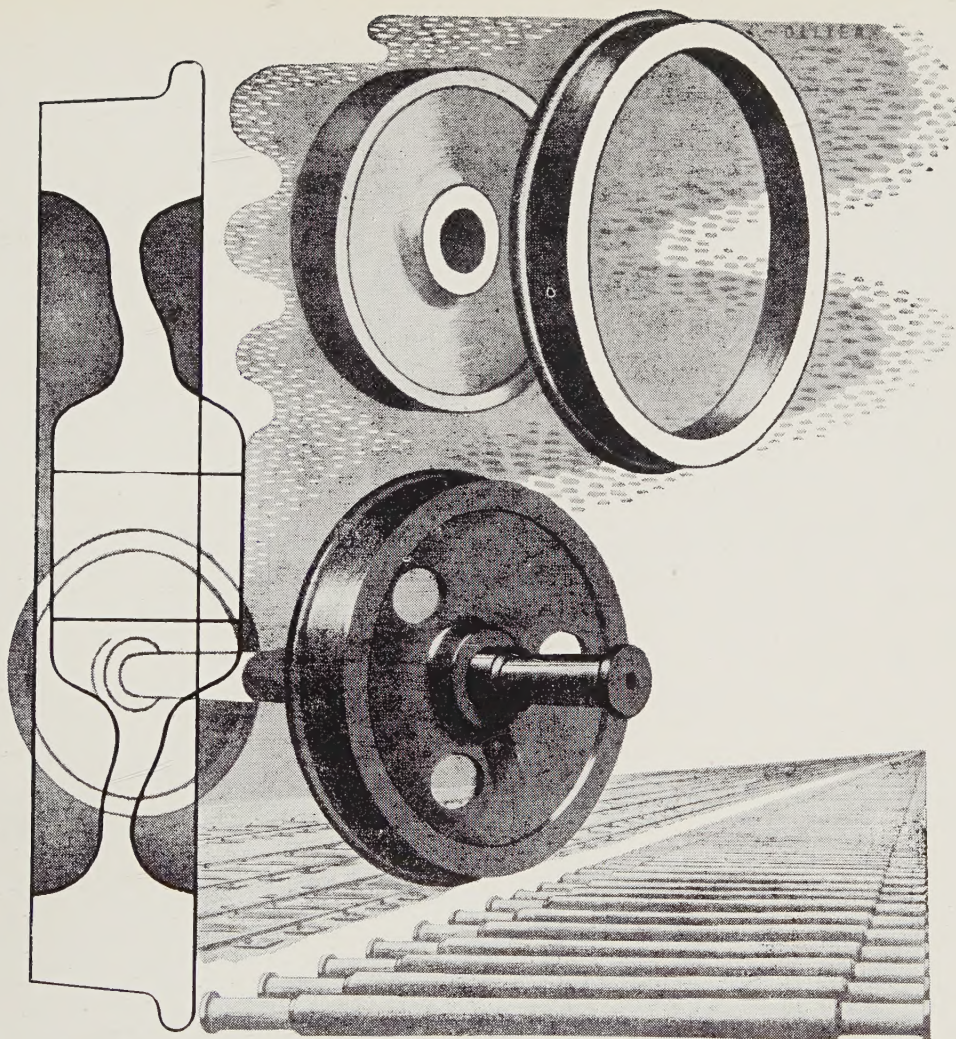
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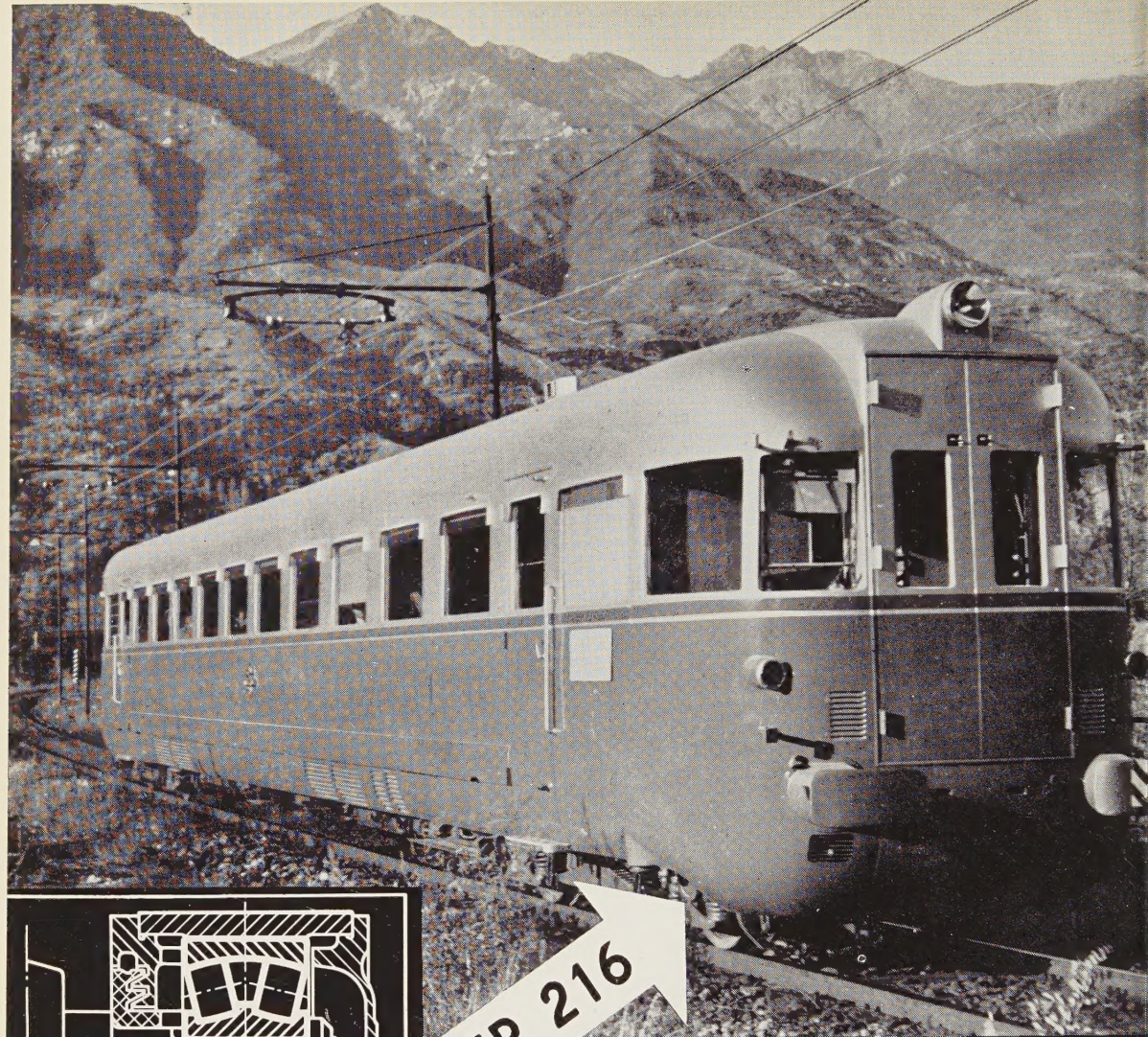
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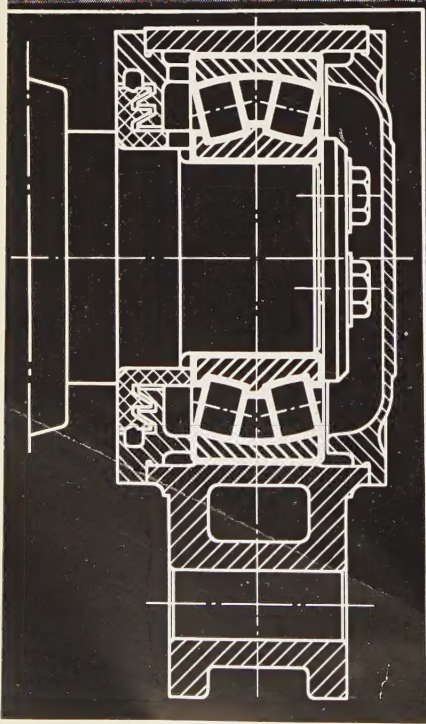
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CONTENTS OF THE NUMBER FOR DECEMBER 1951.

1951 385 (06. 112
Bull. of the Int. Ry. Congr. Ass., No. 12, December,
p. 799.

Fifteenth Session. Rome : 25th September-4th October 1950. — General Proceedings in sections and in plenary meetings (5th Section : **Light Railways and Colonial Railways**). (40 000 words.)

1951 625. 614 & 656. 27
Bull. of the Int. Ry. Congr. Ass., No. 12, December,
p. 801.

Modernisation of the maintenance methods of the permanent way on the light railways. (Question XIII, 15th Congress). — Discussion. (14 000 words.)

1951 621. 431.72 & 625. 616
Bull. of the Int. Ry. Congr. Ass., No. 12, December,
p. 827.

Change over from steam locomotive traction to Diesel traction. (Question XIV, 15th Congress). — Discussion. (12 000 words.)

1951 656. 255
Bull. of the Int. Ry. Congr. Ass., No. 12, December,
p. 848.

Signalling on single track lines. (Question XV, 15th Congress). Discussion. (14 000 words.)

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An edition in French is also published.

BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

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FIFTEENTH SESSION

Rome : 25th September-4th October 1950.

GENERAL PROCEEDINGS

5th Section : **LIGHT RAILWAYS AND COLONIAL RAILWAYS**

INAUGURAL MEETING
September 26th, 1950, at 9 a. m.

PROVISIONAL PRESIDENT : MR. DEVOS,
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

— The Meeting opened at 9 a.m.

The President (in French). — Gentlemen, the Permanent Commission of the Association requested me to preside over the inaugural meeting of the Vth Section and to make up its Bureau.

On behalf of the Permanent Commission, I suggest that Mr. W. A. VRIELYNCK, Directeur du Service de la Traction et du Matériel de la Société Nationale des Chemins de fer Vicinaux de Belgique, be elected as *President*.

You all know, I presume, Mr. VRIELYNCK, therefore I have not to introduce him to you. He has attended several Congresses and on several occasions he has been Reporter. This time again, he has been designated Special Reporter for an important question : Signalling on single track lines.

Mr. VRIELYNCK is for me a valuable collaborator, of whom I have been able to appreciate the eminent qualities. I am sure that with your co-operation, he will end happily the works of your Section.

As it is unanimously agreed. I ask Mr. VRIELYNCK to take the Chair of the Vth Section.

Mr. VRIELYNCK *took the Chair.*

The President (in French). — I wish, first of all, to thank Mr. DEVOS for the high terms he has just spoken in my favour, as well as all the Colleagues present, for the kindness with which they have agreed to my appointment as President. I will do my best so that our common work will profit to the Railway systems concerned.

Gentlemen, for the constitution of the Bureau of the Section, I propose to appoint :

as *Vice-Presidents* :

Mr. A. CLEMANG, Commissaire du Gouvernement pour les Affaires des Chemins de fer (Luxembourg);

Mr. P. CHRISTENSEN, Secrétaire général au Ministère des Travaux Publics du Danemark;

Mr. Y. GIROUD, Chef du Service des Transports à la Direction des Travaux Publics (Tunisie); and

Mr. H. SPARROW, Chief Mechanical Engineer, North Western Railway (Pakistan),

and as *Principal Secretary* :

Mr. F. VAN LIERDE, Ingénieur en Chef à la Société Nationale des Chemins de fer Vicinaux (Belgique).

(*Marks of approval and applause.*)

— Following a proposal of the PRESIDENT the Section completed its Bureau and drew up the agenda.

QUESTION XIII.

Modernisation of the maintenance methods of the permanent way on the light railways.

Preliminary documents.

Report (Austria, Belgium and Colony, Bulgaria, Denmark, Spain, Finland, France and Overseas Territories, Greece, Hungary, Italy, Luxemburg, Norway, Netherlands and Colonies, Poland, Portugal and Colonies, Rumania, Sweden, Switzerland, Syria, Czechoslovakia, Turkey and Jugoslavia), by L. RIPERT. (See *Bulletin* for May 1950, p. 877, or separate issue No. 19.)

Report (America (North and South), Burma, China, Egypt, Great Britain and North Ireland, Dominions, Protectorates and Colonies, India, Iran, Iraq, Malay States and Pakistan), by J. R. FARQUHARSON. (See *Bulletin* for May 1950, p. 1069, or separate issue No. 22.)

Special Reporter : L. RIPERT. (See *Bulletin*, October 1950, p. 2135.)

DISCUSSION BY THE SECTION.

Meeting held on September 26th, 1950.

PRESIDENT : Mr. W. A. VRIELYNCK.

— The Meeting began at 9.15 a.m.

The President (in French). — Gentlemen, as you know the agenda for Section V includes the study of three questions.

Before beginning to examine them, I would like to call your attention to the fact that Section V is concerned solely with light and colonial railways. However, questionnaires were sent to the main line railways. Some of them very logically replied that the question did not concern them. Others probably looked upon it from their own special point of view;

whilst others considered that the questions referred to their secondary lines. It is an undoubted fact that the secondary lines of the main line railways have — or will have — a tendency to change over to light railways or even in certain cases give place to the omnibus.

The result of all this — as was only to be expected — was that the Reporters perpetrated a certain confusion in their summaries and in the way they drew up their report. This was inevitable. It was necessary first of all to give a definition of what is meant by light and colonial

railways. In the case of the latter, the question would not have arisen 50 years ago. At that time, the answer would have simply been that a colonial railway is one built in a colony. But at the present time, the question arises under other aspects. Therefore I suggest that we say that in our days a colonial railway is a railway generally constructed in a tropical and not much industrialised region; that such a railway is used above all for the transport of goods : the export of raw materials, and the import of the products needed for the native population, which in general is not very civilised.

As for the light railway, this cannot be distinguished from the ordinary railway either by its profile, its gauge, nor by the speeds reached nor even the frequency of the trains nor the density of the traffic. The essential difference, it seems to me, lies in the fact that the trains of light railways are much lighter, much shorter, that the distances covered are generally shorter, that such railways are not built as a rule on their own separate foundations, and that there are very few stations, at least for the passenger services.

There is moreover a very great difference between the various light railways themselves. Some of them were built in order to develop regions of widely different characters : industrial regions, agricultural regions, or forestry regions. In the case of others, their activities are orientated towards the solutions proper for countries with a very dense population.

The topography of the country also leads to very different methods of working: lines built in mountainous or flat country.

The result of all these different factors is that with regard to the light railways,

there are different solutions possible for the same question. This was stressed by the Special Reporter.

Having made these preliminary remarks, I suggest that we immediately go on to examine Question XIII, the Special Reporter for which is Mr. RIPERT.

Mr. RIPERT drew up a very complete and detailed report, which sums up the essentials of the question extremely well. The Meeting will no doubt agree with me that a detailed consideration of all the questions into which he went would take us too far. I will therefore ask to Mr. RIPERT to give us a general summary of his report.

Mr. Ripert, Special Reporter (in French).

— Mr. PRESIDENT, Gentlemen, the investigation into the modernisation of maintenance methods for the permanent way on secondary railways was divided into three parts : 1) modernisation of the maintenance methods properly speaking; 2) modernisation of the organisation of the staff; and 3) mechanisation of the tools.

These three parts are of diminishing importance, as regards the extent of their application on the railways. In effect, *modern methods of maintenance* consisting essentially of periodic overhauls, generally took the place of maintenance as found necessary (by 4/5th of the Administrations who replied to the questionnaire).

Grouping the staff into large gangs responsible for maintaining long sections, equipped with collective methods of transport is the practice of a fairly large number of Administrations (about 2/5ths).

Finally, the *mechanisation of the tools*,

especially the use of motor driven tools has been the practice on several railways for some years (about 2/5ths).

It should be noted that these various elements are connected together: to organise overhauls with a satisfactory output, it was necessary to increase the size of the gangs, and consequently increase the lengths of the sections for which they were responsible, whilst reducing their kilometric density. As for the use of motor driven tools, their use is in fact only effective when they are used for methodical overhauls.

First of all, we will run through the principal methods adopted, and then the results obtained.

1) The most usual maintenance methods consist of a *general overhaul*, which is continuous and covers a small fraction of the system every year, with *part overhauls* of certain defective points lying outside the fraction in question. Certain railways complete this by a *reduced overhaul*, concerned above all with the level and the tightening up the fastenings, in order to make the state of maintenance of the railway as a whole more homogeneous.

The general overhaul cycle varies most often between four and six years.

In addition, certain sections of line are sometimes *renewed*.

As regards the details of the application of overhaul methods, certain processes are frequently employed, such as:

- building up worn fishplates, or fitting shims between the rail and fishplates;
- welding rail joints, limited in most cases to certain special zones, and building up the frogs;

- laying the rails on the sleepers or on metal or wood bearing plates;
- tightening up the coachscrews;
- binding the ends of split sleepers;
- making use of special devices to prevent the gauge widening on curves;
- levelling by measured shovel packing or mechanical or hand tamping;
- adjusting curves by the versine method;
- chemical weedkilling along the track.

II. — As regards the *staff*, though the traditional organisation into small gangs of three to six men responsible for sections 6 to 14 km (3.7 to 8.7 miles) long has been retained on most of the railways, the men have been grouped into large gangs responsible for long sections on certain lines belonging to fifteen Administrations. The number of men in such gangs and the lengths of their sections vary considerably: from eight to fifteen men, and exceptionally up to thirty men for sections 20 to 80 km (12 to 50 miles) long.

The long distance gangs most often have some collective method of transport available, amongst which motor trolleys are the most usual.

In order to encourage the staff to increase their output and the quality of their work, several Administrations have introduced premiums, either collective or individual, or both combined, or prizes for the gang responsible for the best section in each area.

III. — As regards *modernisation of the tools*, certain railways besides mechanised tools make use of motor driven equipment, the principal ones being:

- rail drills; machines for sawing the

rails; drills for wood sleepers; coach-screw-drivers; tools for recutting wood sleepers; tampers; ballast cleaners.

The most widely used of such tools are the sleeper drills and coachscrew-drivers.

Generally, the railways who have made use of these different methods state they are satisfied with the results and the tendency on some of them is to study new methods in order to develop them, for example by creating very large gangs equipped with powerful motor trolleys and motor driven tools.

Other railways are studying which of these methods are the best adapted to their special conditions.

It therefore appears useful to sum up the different opinions regarding the advantages and drawbacks discovered in applying these methods, from the triple point of view of the technical, economic and social aspect, and to bring out the conditions which must be fulfilled for them to be effective.

1) Regarding the advantages of the maintenance methods properly so-called, there is more or less unanimous agreement : the more systematic the operation, the better should be the state of the track, maintenance work carried out with greater precision being more durable and more easily checked; in addition the improvement in output has resulted in a saving in labour sometimes as great as 20 or 25 %.

2) As regards the *constitution of the larger gangs*, responsible for longer sections and equipped with means of transport, the generally agreed advantages are the following : the application of the methods of overhaul and supervision of the work are more certain. This organisation is an essential condition for

the functioning of mechanised jobs; it makes it possible to send the labour very quickly to any point on the section; it normally results in a saving in labour (estimated at 5 to 15 %). From the social point of view, the use of collective methods of transport means that getting to and from work and working will be less tiring to the men, and in addition the grouping together of the men makes their life easier, especially when the railway runs through very sparsely populated districts.

On the other hand, as stressed in Mr. FARQUHARSON's report, some of these advantages are disputed by several Administrations who consider that grouping the staff in this way does not always result in improving the average condition of the permanent way nor an increase in the output per man. It is found in fact that the members of small gangs often have a greater feeling of solidarity and responsibility than those of larger gangs.

Consequently, it may be stated that to obtain satisfactory results, these different conditions must be combined, namely : the quality of the gang foreman as a leader, the grouping of the staff at headquarters or close by, rapid means of transport, and a normal state of repair of the section.

3) Regarding the use of mechanical appliances, the chief technical and economical advantages of these are : better quality work than that carried out by hand; and appreciably increased output. From the social point of view, the muscular effort required of the men is diminished and the work is considered by some of them much more attractive.

On the other hand, those railways which are highly mechanised report that the chief drawback is the unwillingness of men accustomed to use machines to carry out any manual work when no machines are available.

The proper working of a mechanised job therefore seems to require the combination of the following conditions : its organisation must be carefully studied and supervised, and the mechanical appliances must have a sufficient user within the framework of the overhaul of the permanent way to make them a paying proposition. This means that the work carried out by the gangs must not be too varied nor too dispersed. In addition, the men must be sufficiently skilled to operate and maintain the machines, and spare machines and spare parts are essential to minimise the results of any breakdowns which might interrupt the work in hand.

To sum up, amongst the questions studied, those which might be the subject of an exchange of views are the following :

conditions under which the maintenance methods are applied and determination of the overhaul cycles;

comparative advantages of the different methods used during the work of maintenance;

conditions which determine the number of men in the gangs and optimum length of sections, choice of method of transport for the gangs; effects of production premiums granted to the staff based on the quality and output of work;

use of mechanical tools.

It would be useful to collect additional information on the characteristics of the most widely used appliances, on the organisation of mechanised jobs, and the results obtained, as the railways are only partially mechanised and much remains to be done in this connection.

The President. — I thank Mr. RIPERT for his report, and shall be obliged if he will read us the Summaries from his report one by one.

Mr. Ripert. — *Summary No. 1 :*

1. The question of the modernisation of permanent way maintenance methods can be divided into 3 parts :

(a) modernisation of the maintenance properly so-called (very generally applied);

(b) modernisation of the organisation of the staff (applied on many railways);

(c) modernisation of the equipment (only applied on some railways).

The President. — It seems to me that the text of Summaries Nos. 1 and 2 might be condensed a bit. As worded at present they are merely a series of statements of facts, very complete of course, but I think it would be better to state them in a more positive form. (*Agreed.*) Will Mr. RIPERT please read Summary No. 2 as well.

Mr. Ripert. — *Summary No. 2 :*

2. *Maintenance methods.* — Most of the railways have replaced haphazard maintenance as required by various periodic overhauls, taking place every year on some section of the line. The methods most widely used are the following :

— *general overhaul* of a section according to a programme including the carrying out of all operations required to correct any defects (maintenance of the material and

fastenings, the level and alignment, the formation), with *partial repairs* according to need at certain points outside these sections;

— *integral overhaul* of a part of the line, affecting the material, the level and the alignment, with *reduced overhaul* of the level and tightening up the fastenings of another part, and for the rest of the lines, partial repairs as required as above.

The length of the overhaul cycles is generally 4 to 6 years.

Some railways renew the rails and sleepers on certain sections of the system every year.

Opinions are more or less unanimous on the efficacy of such systematic maintenance; the work is carried out with greater precision, lasts longer, and supervision is easier; the increase in the output obtained generally makes it possible to make economies in labour.

The President. — After the report the Special Reporter has just given us, I suggest that the following text would be suitable as *Summary No. 1* :

« 1. The view is almost unanimous as to the efficiency of systematic maintenance; most of the systems have replaced haphazard maintenance by various methods of periodic overhaul :

« a) *General overhaul* of certain sections according to a programme, accompanied by *partial repairs* on some other parts of the system;

« b) *Complete overhaul* of certain sections according to a programme accompanied by a programme of *reduced overhaul* of other sections and by *partial repairs* elsewhere. »

Has anyone any objections to put forward?

— *The new text of Summary No. 1 suggested by the PRESIDENT is adopted.*

The President. — It seems to me that we should now examine the *length of*

the overhaul cycles, which might be the subject of Summary No. 2. (*Agreed.*)

Will the Special Reporter please be good enough to read that part of Summary No. 2 which deals with this particular point.

Mr. Ripert. — Here is the part of Summary No. 2 which deals with the *length of the overhaul cycles* :

The length of the overhaul cycles is generally 4 to 6 years.

Some railways renew the rails and sleepers on certain sections of the system every year.

Opinions are more or less unanimous on the efficacy of such systematic maintenance; the work is carried out with greater precision, lasts longer, and supervision is easier; the increase in the output obtained generally makes it possible to make economies in labour.

The President. — There may be certain objections raised in connection with this point. The light railways differ considerably one from the other. The text speaks of cycles of 4 to 6 years. Perhaps this is not the opinion of all of them.

Mr. Coursin, Chemins de fer de Madagascar (in French). — In densely wooded areas, overhauls have to be more frequent.

The President. — At what intervals, for example?

Mr. Coursin. — Every two years. This would probably also be the case for most of the areas in Indochina.

The President. — To what do you attribute this necessity?

Mr. Coursin. — To the special climatic conditions, but also to the fact that these

lines were built a long time ago. They are not up to date lines.

The President. — You mean by this that these lines were built under very poor conditions right from the beginning?

Mr. Coursin. — Yes, lines which have not been brought up to date from the time they were built.

The President. — In your case therefore it is more a question of adaptation than maintenance?

Mr. Coursin. — Of both.

The President. — Do the climatic conditions really have a decisive influence as far as the maintenance is concerned? Do they really make overhauls necessary at shorter intervals?

Mr. Coursin. — Indubitably; experience has proved it. The forest has a very bad effect on the conservation of the ballast. A much closer check has to be kept and maintenance has to take place more frequently. Consequently, the cycles have to be very short.

The President. — Have the Delegates from other tropical regions come to the same conclusions as Mr. COURSIN?

Mr. De Backer, Ministère des Colonies, Belgique. — I support Mr. COURSIN's statements. We have come to exactly the same conclusions.

Mr. Ripert. — Other railways are also of this opinion. But other factors have to

be taken into account. Different results are obtained according to the kind of ballast, broken stones or sand.

The President. — What sort of ballast is used in your region, Mr. COURSIN?

Mr. Coursin. — The ballast is broken stone. The rainy season also has a very great influence on it.

The President. — In the light of what has just been stated, let us say that the overhaul cycles are between 2 and 6 years according to the region, according to the conditions under which the permanent way was constructed, and finally according to the efforts made to adapt it to present day traffic conditions.

Does anyone else wish to say anything?

As no one else has made any comments, I suggest the following text for the *new Summary No. 2* :

« 2. The lengths of the cycles of repairs vary between 2 and 6 years according to climatic conditions, and the nature of the ballast, and are dependent on the necessity for altering the permanent way for new traffic conditions.

« In cases where the length of the cycle is 2 years the tendency is to try to increase the length of the period. »

— *Adopted.*

We will now go on to the next Summary.

Mr. Ripert. — It is a question of the following paragraphs :

Some railways renew the rails and sleepers on certain sections of the system every year.

Opinions are more or less unanimous on

the efficacy of such systematic maintenance; the work is carried out with greater precision, lasts longer, and supervision is easier; the increase in the output obtained generally makes it possible to make economies in labour.

There is no connection between these two paragraphs. The last paragraph is in fact a summary of that preceding it.

The President. — Perhaps we could simplify the text and say :

« The rails and sleepers on certain sections are renewed annually » (*Agreed.*)

— *This text is adopted as the new Summary No. 3.*

The President. — We now come to Summary No. 3 of the special report dealing with the conservation and consolidation of the material.

Mr. Ripert. — *Summary No. 3 :*

3. Various satisfactory methods are used for the conservation and consolidation of the material, in particular :

— restamping the fishplates or inserting packings;

— welding rail joints and building up the frogs of crossings;

— re-using damaged holes in the sleepers by using wooden pegs and drilling the pegs, or by using packings or wedges;

— conserving the bearing surfaces by the use of sole plates or wooden bearing plates;

— binding split sleepers;

— maintaining the gauge on curves of small radius by the use of wedges, stops, plates, cleats or ties.

The President. — Is re-stamping carried out on all the railways represented? It seems to be quite a general practice.

Welding the rail joints and building up

the frogs at crossings are done I believe, on all light railways at the present time. And it is probably the practice on the Colonial Railways?

Mr. Coursin. — Yes.

The President. — Are you all agreed about the paragraph dealing with re-using damaged holes in the sleepers? (*Agreed.*)

About conserving the bearing surfaces? I think this summary is quite a general one. (*Agreed.*)

Binding split sleepers? Perhaps this is a rather more controversial point. Is it the current practice everywhere? In the colonies as well?

Mr. De Backer. — In the Belgian Congo nothing but metal sleepers are used.

Mr. Coursin. — In the French Colonies both metal and other kinds of sleepers are used.

Mr. Ripert. — It does not seem admitted by all railways that binding gives rise to very interesting savings.

The President. — It probably depends on the cost of labour; if wages are high, no appreciable savings can be expected.

Mr. Van Lierde, Principal Secretary. — « S » irons are sometimes used to bind new sleepers.

The President. — To sum up, I think everyone agrees to the text of *Summary No. 3 which becomes the new Summary No. 4.* (*Agreed.*)

Mr. Ripert. — This brings us to *Summary No. 4* :

4. The railways using measured shovel packing get greater precision and a better output than from tamping.

Mr. Coursin. — This is all very well for extensive systems. But it is a very delicate point.

Mr. De Backer. — Measured shovel packing is hardly ever used in the Congo.

Mr. Protat, *Chemins de fer de l'Indochine* (in French). — It is an even more delicate question for us. This is a question of permanent labour.

Mr. Devos, *Société Nationale des Chemins de fer Vicinaux, Belgique* (in French). — Amongst the Delegates present, which railways make use of measured shovel packing?

Mr. Ripert. — According to the replies received, it is practised on 9 railways.

The President. — So we cannot speak of a majority. What is the proportion?

Mr. Ripert. — Out of 39 Administrations, 9 make use of shovel packing.

The President. — The proportion is therefore about 1 in 4.

M. Ripert. — According to the replies received, these Administrations found shovel packing satisfactory. Only one system, the Portuguese Railways, report that they have given up this method of working on account of the high cost of

gravel and the effects of the banking up of the ballast resulting from shovel packing.

The President. — From the replies received, it can be concluded in any case that one quarter of the railways use shovel packing and find it satisfactory, apart from the Portuguese Railways. Can any delegate representing this Administration give us some further details?

Mr. Sales Lane, *Chemins de fer de l'Etat dans les Colonies portugaises* (in French). — I do not really represent Portugal as I am the delegate for the Portuguese Colonies; consequently I cannot reply as I am not in full possession of the facts, as the position in the Colonies is not the same as at home. In the colonies, we do not make use of measured shovel packing.

Mr. Devos. — Are there any delegates present representing Administrations which make use of this method?

Mr. Sanders, *Malayan Railways.* — The Malayan Railways have used shovel packing since 1937.

Mr. Ripert. — The Administrations who use shovel packing are named in the report.

The President. — Are there any other representatives in the Section of Companies using shovel packing? Perhaps Mr. DEVOS would like to ask them some questions about it?

Mr. Devos. — I should like to know : 1) if they find it satisfactory; 2) if they noted any improvement?

Mr. Vincent, *Compagnie des Chemins de fer secondaires du Nord-Est, France* (in French). — We use shovel packing on the lines we operate on behalf of the S. N. C. F., as required by them. We do not use it on our local lines, I think that shovel packing has real advantages in the case of these main lines, but is not advisable on local lines, where less is spent on maintenance, which are generally equipped and maintained at a lower level. Our local lines are lines with very little traffic, on which we are content with lower speeds, and where the maintenance is rather summary, whereas the lines on which we use shovel packing are S. N. C. F. lines with much more traffic.

The President. — Do you not think these secondary lines would find it useful to turn themselves into light railways?

Mr. Vincent. — No, because the traffic is different. The traffic is more important on these lines than on ours.

The President. — From the point of view of frequency?

Mr. Vincent. — From the point of view of the train loads, their frequency and their power; in fact, from every point of view.

Mr. Ripert. — These lines are operated above all for the transport of goods.

The President. — And also from the passenger point of view?

Mr. Vincent. — No, rather the goods.

The President. — Let us say 50/50.

Mr. Vincent. — Yes, about.

Mr. Devos. — I was under the impression that shovel packing was a new maintenance method, more economical than other methods, I see now that certain railways that know this method because they use it as required by the S. N. C. F. do not make use of it on their own lines. Are we to conclude that this method costs more than the usual methods? That it may perhaps give better results, but only pays for itself when the traffic is sufficient to justify its use? This seems to me the conclusions to be drawn from this exchange of opinions.

Mr. Ripert. — I should like to point out regarding the lines operated by the « Société Générale des Chemins de fer économiques » that we use shovel packing not only on lines depending of the S. N. C. F., but also on certain other lines of local interest, where owing to the speed of the trains, we consider that there is a real technical advantage in shovel packing in order to obtain a more accurate level, or some real economic advantage, although the latter may not be immediately apparent. In fact, following the supply of gravel during the first operation, the savings only are obtained after the second operation.

The President. — I should like to ask Mr. RIPERT if this method is used on all the lines?

Mr. Ripert. — We have not used it for any length of time on lines of local interest. It is only used up to the present on the more important lines ballasted with broken stones. The output with shovel packing is undoubtedly interesting : it reaches 24 m (79') per man per day compared with 12 m (39') only with tamping. The output is therefore doubled; in certain cases it is tripled.

The President. — The Summary therefore will be that shovel packing is much more economical than tamping; let us say a saving of 50 %.

Mr. Ripert. — Yes, apart from the initial capital cost of obtaining the gravel, which only occurs in the case of the first time the method is used.

The President. — You do not therefore include the gravel in your estimate of the saving?

Mr. Ripert. — Obviously, the cost of same, must be deduced.

The President. — It would be interesting to know how much it amounts to. Do you use the same method with metal sleepers or is it only used with wood sleepers?

Mr. Vincent. — The question does not arise in our case as we have no metal sleepers.

Mr. Sales Lane. — I am very sceptical about the efficiency of shovel packing and I would like to know the opinions of the railways who use this method.

The President. — It seems that shovel packing is not used with metal sleepers.

Mr. Masseron, *Compagnie Ferrière des Chemins de fer tunisiens* (in French). — The Tunisian Railways use it with metal sleepers.

The President. — Do you agree with the figure given : a saving of 50 %?

Mr. Masseron. — It is rather difficult to estimate, it depends on specific cases.

The President. — Has the method been in use for several years?

Mr. Masseron. — For at least 12 or 15 years.

The President. — I suggest saying that shovel packing is used very little in the colonies; in European countries, or on non-colonial railways, it is used by about one third of the systems; certain systems such as the Portuguese Railways have given it up; others have only used it for 4 or 5 years and are observing the results obtained before generalising it or finally giving it up; that the saving in labour appears to be about 50 %.

Mr. Devos. — I do not think that such a summary is sufficiently precise, it gives the impression that those who use this method are completely satisfied with it.

Mr. Ripert. — All those who use it state that they are satisfied, except the Portuguese Railways, who have given it up owing to the high cost of the gravel.

Mr. Devos. — I am wondering if there was not some other reason originally for them giving it up. On the one hand, they tell us that the first operation costs a lot, especially in the case of secondary lines; a large quantity of ballast has to be added. On the other hand, many secondary lines are being given up. It may be wondered whether it is not this fear which prevents the process being extended; certain railways hesitate to undertake it in view of the too high cost.

The President. — Obviously this is one way of looking at it.

Mr. Devos. — The secondary lines in general are threatened. They fear the future and would be prepared to adopt shovel packing if they were sure of their continued existence.

The President. — The Portuguese Railways expressed the opinion that they tried shovel packing but found it too costly because they cannot buy the necessary gravel cheaply enough. This is an important point of view; here we have not merely technical considerations but also economic considerations, social and perhaps political ones. In effect it is necessary to avoid spending money from which no profit will be reaped; since only one third of the railway use shovel packing, it seems to indicate that, as Mr. DEVOS says, the others are not very sure of the economic results on the one hand, and on the other have doubts concerning the continued existence of their lines.

Mr. Ripert. — These general observations make it clear that we have here a new

method which involves certain capital costs.

The President. — Naturally, to buy the tools, materials, etc. The Summary would therefore state that shovel packing appears indicated in the case of all secondary lines whose future existence is assured.

Mr. Coursin. — The day gravel gets cheaper, the question will be virtually solved.

The President. — So it is solely a question of economic considerations.

Mr. Coursin. — Certainly, there is the economic aspect, but there is also the question of the staff. We do not condemn the system, but under present circumstances it is not sufficiently economical to interest us.

The President. — Probably the question of cheap labour does not arise in the case of the colonies?

Mr. Coursin. — Indeed it does, skilled labour costs a lot there too.

The President. — So you are short of skilled, specialist staff? Your present staff having never used this method, you dare not entrust it to them? And the temporary staff?

Mr. Coursin. — I do not think that is any solution.

The President. — It might therefore be stated in the Summary that shovel pack-

ing requires a trained staff, which is not the case with the other methods.

Mr. Ripert. — The Tunisian Railways state that the training of the staff is one of the most important aspects of using shovel packing.

Mr. Masseron. — The Tunisian lines are partly laid on metal sleepers.

The President. — The discussions show that Summary No. 4 (*new No. 5*) might be worded as follows :

« 5. Measured packing cannot obviously be applied when it is a question of lifting a track considerably. Measured packing is technically better than beater packing; it is more economical (the output per man is at least doubled), provided skilled labour is available and the cost of the ballast is low.

« On account of greater accuracy, measured packing is particularly desirable where speeds are high.

« There is a tendency to adopt measured packing generally where the organisation is on a sound financial basis. »

(*Agreed.*)

We will now go on to the next Summary about the *correction of the alignment*.

Mr. Ripert. — *Summary No. 5 :*

5. The correction of the alignment by the versine method with a calculation of the errors and marking the correct position, used by many railways (sometimes with the assistance of a calculating machine) makes it possible to get regular curves without proceeding by trial and error on the site.

The President. — Does anyone wish to say anything about this Summary?

— *Adopted as new No. 6.*

Mr. Ripert. — *Summary No. 6 :*

6. Chemical weed-killing is replacing hand weeding on most railways; the most usual weedkiller is chlorate of soda in solution in water, or pure, or mixed with other salts.

Mr. Protat. — In Indochina, chemical weed-killing does not give good results owing to the rainy season.

The President. — Do you attribute this to the fact that the chemicals are washed out? Have the other Colonial Railways found the same?

Mr. Devos. — Chemical weed-killing has to be done at the right time.

Mr. Protat. — That is the core of the matter, but in practice it is very difficult. During the dry season it is useless, and during the rainy season the results are absolutely nil.

The President. — Your rains are obviously disastrous since they carry everything away. The question probably does not arise in other countries?

Mr. Coursin. — We prefer to weed by hand as this costs less.

The President. — It is always the same problem which arises in the case of the colonies : the cost of unskilled labour.

Mr. Protat. — I would like to know if any other Administrations kill the weeds by flame-guns?

Mr. Sales Lane. — The North Railways of Angola have tried every method of

destroying weeds : the chemical method using sodium chloride, which is cheap if the railway is not far away from the sea; destruction by fire by means of a flame gun, a method which can only be used during the dry season. It must be remembered in effect that the rains at certain times of the year and in certain regions are such that chemical weed-killing is completely ineffectual. The vegetation is so dense that it will stop the trains.

The President. — I suppose burning can only be used with metal sleeper.

Mr. De Busschere, *Chemin de fer du Bas-Congo au Katanga*. — In Africa, we have used flame guns to destroy the weeds along the permanent way and telephone and telegraph lines.

The vegetation is not sufficiently heavy in every district to justify the use of flame guns. Unfortunately, the guns chosen for the trials were not powerful enough, and the results were not as good as expected. Under these conditions, the trials were not continued. We will probably carry out some further trials on the permanent way itself, in spite of this setback. In the Congo, it is not always necessary to use such violent methods. They are perhaps necessary in other parts of Africa where the vegetation is heavier than with us. In any case during the rainy season, chemical weed-killers have been proved to be ineffectual. We do not use chemical products; they cost too much.

Mr. Farquharson, *Reporter*. — Of the railways reporting in English only the Pennsylvania Railroad in the U. S. A.

mentioned the use of weed burning, the system being to have a machine with 5-burner units, two on each side and one in the centre of the track. The weeds are burnt off once, and sometimes twice a year.

The President. — With what sort of sleepers?

Mr. Farquharson. — All timber sleepers were used and no metal sleepers. I, myself have had no experience with burning weeds.

The President. — The discussions show therefore that in non-tropical regions, where the rainfall does not prevent the use of chemical products, weed-killing is done by means of sodium chloride or other chemicals; whereas in the tropical regions flame guns are now beginning to be used which destroy the vegetation not only on the permanent way itself but alongside the lines. According to what we have just learnt, these flame guns give good results. In addition, this method also appears to be regularly used in the United States of America.

Mr. Ferreira, *Chemins de fer du Benguela*. — This solution seems to me excellent, but I wish to point out that on the Benguela Railways, situated in Angola, a less tropical region, flame guns are not used even between the rails. The less luxuriant vegetation never stop the trains running and even chemical weed-killing is unnecessary.

The President. — I suggest that Summary No. 6 (*new No. 7*) be worded as follows :

« 7. Chemical weed-killing is replacing hand weeding on most railways; the most usual weedkiller is chlorate of soda in solution in water, or pure, or mixed with other salts. Nevertheless in tropical regions this process is ineffective due to the high rainfall and flame throwers are substituted in some cases. »

Does the Meeting agree?

— *Adopted.*

Mr. Ripert. — *Summary No. 7 :*

7. All the railways prepare maintenance programmes and check the way these are carried out by preparing graphs or tables and by other measurements made directly or recorded by equipment run over the line.

The President. — I think everyone will agree to this Summary? (*Agreed.*)

I suggest a slightly altered wording as follows :

« All the railways prepare maintenance programmes and check the way these are carried out by preparing graphs or tables. »

— *Adopted as new No. 8.*

M. Ripert. — *Summary No. 8 :*

8. *Organisation of the staff.* — On a large number of railways, the practice of dividing the staff up into small gangs has been given up in favour of large gangs maintaining longer sections. The size of the sections and optimum number of men differ appreciably from railway to railway. This organisation makes it possible to reduce the labour required, and facilitates the application of overhaul methods and the supervision of the work, so long as certain conditions are fulfilled.

The President. — I suggest we examine first of all the first paragraph dealing with the tendency to have bigger gangs.

The question in effect is to decide whether in general there is a tendency to have bigger gangs responsible for longer sections. (*Agreed.*)

I will now suggest to the Meeting that Summaries 8, 9 and 10 of the special report be joined into a single Summary, and shall be obliged if Mr. RIPERT will also read Summaries 9 and 10.

Mr. Ripert. — *Summary No. 9 :*

9. The homes of the men are generally sited alongside their sections, sometimes in the railway buildings. In the case of large gangs it becomes necessary to group them at headquarters; difficulties may be encountered due to the shortage of houses, but there may be also social advantages, especially in certain very sparsely populated districts.

Summary No. 10 :

10. The transport of the staff to the place of work is either by individual means (most often bicycle) or collective (trucks, lorries, passenger train or bus). The large gangs usually are provided with motor trucks hauling trolleys.

The President. — Regarding transporting the men to their place of work, I think the tendency at the present time is to make use of collective transport, by bus for example, except perhaps in the Colonies.

Here again it depends on the roads available, unless the road runs parallel with the railway.

We might therefore draft a single Summary as we have just said, worded as follows :

« The question of replacing small gangs by larger gangs maintaining longer lengths and the problems of lodging and

transport of personnel must be considered specially in every case. The organisation of large gangs generally permits an overall reduction of manpower. »

Does the Meeting agree to this text?

— *This text was adopted and becomes Summary No. 9, combining Summaries Nos. 8, 9 and 10 of the Special Report.*

Mr. Ripert. — *Summary No. 11 :*

11. In order to stimulate the output of the gangs, several Administrations grant output premiums. It is generally considered that such premiums give good results.

The President. — This is a general question which does not concern merely the light railways but all railways in general.

It seems to me that there is no need for the 5th Section to vote any special Summary. But we can always express a wish.

Do any of the railways represented here grant output premiums?

Mr. Sanders. — We have no experience of this.

Mr. De Busschere. — We grant output premiums, but I must confess in a somewhat empirical fashion.

The President. — Do you use any special system?

Mr. De Busschere. — The premiums are paid to the native labourers. We have not real system. The amount of the premiums is determined by the European gang foreman. His judgment is the sole basis.

The President. — In fact, it is altogether empirical.

Mr. De Busschere. — Yes, since the evaluation of the work is left to the foreman.

Mr. Ripert. — One third of the railways consulted replied that they granted output premiums. Certain Administrations take into account the quantity and quality of the work, the premiums having at one and the same time a collective and an individual character; for example, the output of each gang is multiplied by an individual coefficient and by a grade coefficient. Other systems are based on both the quantity and the quality; for example, it depends on the length of the section to be maintained according to the prearranged programme and the length actually done, per gang. The gangs are classified according to their output and granted a premium based on this classification. The object is to stimulate the gang spirit, so that the premium has been given a collective character.

The President. — In fact, it is rather like sporting competitions.

Mr. Ripert. — Yes indeed, but within the framework of each gang, the individual coefficient comes into the picture. It is above all a question of appreciation.

Mr. Protat. — The three elements have to be linked up : the length repaired, the quality of the work, the state of maintenance of the bed.

Mr. Ripert. — Obviously, the bases of such premiums are more complicated than in industry for example, where goods are being produced. It is not possible to use the quantity of work done as the sole basis.

Mr. Vincent. — We have some extremely different lines, each independent of the others, on which the methods used are not at all similar. On certain lines, trials have been made, but these railways are not important enough for any definite conclusions to be arrived at.

The President. — The premiums merely reinforce the authority of the foreman. As soon as this authority is accepted, it is obviously possible for the foreman to award the premiums. It seems to me very difficult, however, to give a precise and scientific wording to these facts.

Mr. Ripert. — In certain cases, the premium may amount to 12 % of the employee's wage.

The President. — It leads to emulation but the result is not « measurable ».

Mr. De Busschere. — Account must also be taken of the fact that the premium system may be expensive, as it involves administrative work out of all proportion to the output.

In the Colony, we have very cheap labour.

The President. — We will adhere to the fact that premiums are granted by certain railways, but that the method of granting them is very hard to define, and depends

essentially on the judgment of the gang foreman who supervises the work.

Mr. Coursin. — We might say there are no set rules.

The President. — I suggest we say :

« 10. The introduction of bonuses does in fact provide an incentive in practice. It is difficult to establish the basis on which such bonuses should be based. »

Does the Meeting agree to this text?
(Agreed.)

Mr. Ripert. — This brings us to *Summary No. 12* :

12. Mechanisation of the equipment. — Some railways make use of mechanical tools and plant worked by hand or engine driven (drills and saws for rails, jointing pulling apparatus, coachscrew spanners, drills for sleepers, coachscrew drivers, cutters and shapers, sleeper hooping machines, mechanical tampers, etc.). The most widely used mechanical equipment are coachscrew drivers and sleeper drills. These machines save labour, whilst doing the work more accurately and less tiringly. But it is necessary to have skilled men to drive and work them. In addition their methodical use, generally as laid down in the track overhaul programme, must be on a large enough scale to make good their cost.

The President. — It seems to me that what was said in connection with shovel packing also applies to the question of mechanization of the equipment.

Mr. Coursin. — It is less complicated.

The President. — Obviously, a railway system which is not sure that it will continue in operation for many years will not buy costly machines, although it

may be convinced of the value of mechanization. It will have a tendency to put off buying such equipment.

Mr. Coursin. — We buy them in turn. We « experiment » with them. A good native labourer can learn to use such equipment. It is not the same as shovel packing.

The President. — The individual factor is less important.

Mr. Protat. — Certain Delegates are of the opinion that as far as their railways are concerned, such mechanization is not justified.

The President. — Everyone is convinced that mechanization of the equipment is a very useful thing and to be recommended in the case of railways who are sure of their continued existence. This is just as true in the case of the Colonies as for light railways in developed regions. The appliances most generally used are coach-screw drivers and drills for the sleepers.

I would however like to know if railways with very little traffic are justified in buying such equipment.

Mr. Vincent. — The answer is the same as that given just now. A local railway is not quite the same thing as a secondary railway which is what we are concerned with here.

The President. — Do not forget that we are also addressing ourselves to the local light railways.

Mr. Vincent. — In France, there are some little isolated lines with very few

employees, where there are not even any periodic overhauls. The purchase of mechanical equipment cannot be considered in the case of such systems.

The President. — Do such lines pay their way?

Mr. Vincent. — No.

The President. — Do they fulfil any absolutely indispensable function, for example from the point of view of the goods traffic?

Mr. Vincent. — Yes, in certain cases.

The President. — But in other cases, no? They are therefore likely to disappear?

Mr. Vincent. — Yes. The present tendency seems to be towards doing away with such lines and replacing them by bus or lorry services.

The President. — Each case according to its merits?

Mr. Vincent. — I am speaking in general terms. There is such a tendency in France, but I suppose the situation is similar elsewhere.

Mr. Ripert. — In my opinion, the use of such equipment should be linked up with modern methods of maintenance. Such equipment is best used in cases where there is a programme carried out in a normal fashion, requiring the use of coachscrew drivers, drills and cutters,

in brief a job where a certain output can be obtained.

For such tools to pay their way, the traffic must be sufficiently dense.

Mr. De Backer. — It should be stressed that such equipment saves labour. In certain cases the Government requires them to be used, quite apart from any question of them paying their way. At the present time in the Belgian Congo, the Public Authorities encourage mechanization in order to free labour for other jobs.

The President. — Because the Government considers that there is a shortage of labour in some sections?

Mr. De Backer. — Precisely.

The President. — So the maximum mechanisation is needed.

Mr. Coursin. — Absolutely agreed.

Mr. Masseron. — On the Tunisian Railways also we are extending mechanization as far as possible.

As regards shovel packing, we have used this method for a very long time on the Tunisian Railways. We consider that it is very interesting, since, in general, it doubles the output per man. But, when it is a question of large lifts 3 to 5 cm (1 3/16" to 2") for example, obviously shovel packing cannot be used, and it is replaced by tamping. We make use preferably of mechanical tampers which give considerable savings, in comparison with shovel packing and hand tamping. We use such tampers on

2/3rds of our system; shovel packing is used on the remainder.

Shovel packing involves specially training the men; 2 and 3 years training is needed to make a good shovel packer, but the system definitely pays for itself, as it allows as mechanical tamping to make a methodical maintenance only every 2 years, on lines with 7 to 8 trains a day.

The President. — These remarks confirm what was said just now in connection with shovel packing. We might add that shovel packing involves 2 to 3 years training.

Mr. Masseron. — This training period is in fact essential.

The President. — It would be as well to make it clear that the training of the staff requires 2 to 3 years and owing to this fact in colonial regions for example the method is hardly applicable, and also when long sections have to be renewed, shovel packing is not suitable.

Mr. Ripert. — I do not think we should over-estimate the time needed to train the men. Mr. MASSERON is alluding chiefly to non skilled native workmen, when he speaks of 2 to 3 years training. The method can be used everywhere, where no long sections have to be relaid. In the latter case, mechanical tamping is justified.

The President. — The time taken to train a workman will obviously vary according to the individual. A workman with special aptitude can be trained in six months.

Mr. Masseron — No, it takes 2 or 3 years according to our experience to get good specialists, and shovel packing is a work which requires accuracy.

The President. — Let us say that in general it takes 2 or 3 years in the colonies. But even in certain European regions, the time will be more or less long according to the aptitude of the employees and their general professional training.

Mr. Masseron. — It is necessary to insist on the standard required. Quality must never be sacrificed to quantity.

The President. — Above all, it is necessary to be able to count on the foreman.

Mr. Coursin. — And above all, on the professional conscience of the men.

The President. — As regards the mechanization of the equipment, we might say that everyone recognises the utility of these machines which undoubtedly pay for themselves, but the acquisition of such machines will depend on the financial possibilities of the railway, and in particular its expectation of life.

Mr. Masseron. — On the Tunisian Railways, the large machines are not bought; they are hired from the builder.

The President. — This is obviously another factor. The question for the railways is to know over what period such machines can be written off.

Mr. Ripert. — Gentlemen, the report gives the replies received on this point

from the different railways regarding the saving in labour due to mechanization.

I will not go into the figures. You will have noted that these savings are considerable.

The President. — After this exchange of views I suggest wording the Summary as follows :

« The general tendency is to mechanize tools and equipment and this considerably increase output. In certain Colonies besides, mechanization is essential in order to conserve manpower. Mechanization does not necessitate specially skilled manpower. »

— *This text was adopted as new Summary No. 11.*

Mr. Ripert. — *Summary No. 13 :*

13. The results obtained by the application of the overhaul methods, the grouping of the staff into large gangs, and the mechanization of the equipment, are generally considered satisfactory from the three points of view of technical efficiency, economic results, and social results, although it is often difficult to show the results attributable to each of them in the balance sheets.

The railways using such methods tend to extend them. Other railways are considering their adoption to some extent. In particular, the use of motor-driven tools, which is still very limited, might with advantage be developed.

The President. — In my opinion, this Summary merely repeats what as already been summed up in the summaries we have adopted. I suggest therefore suppressing this Summary which is a mere repetition. (*Agreed.*)

— *Summary No. 13 was suppressed.*

The President. — It remains for me to thank Mr. RIPERT, Special Reporter, who submitted such a very complete report. Mr. RIPERT's very painstaking work enabled us to have some very interesting exchanges of opinions. I also wish to thank all those who took part in the discussions.

This brings us to the end of the discussions on Question XIII.

We still have to confirm the summaries arrived at. The Meeting is no doubt

prepared to leave the final drafting of these summaries to the Office, the Special Reporter and the Secretaries? (*Agreed.*)

The text will be published in to-morrow's *Daily Journal* and at our next meeting we will read the text again and take a final vote on the Summaries agreed to-day.

As no one else has any comments to make, I declare the Meeting at an end.

— The Meeting adjourned at 11.5 a. m.

Meeting of the 27th September 1950.

PRESIDENT : MR. W. A. VRIELYNCK.

— The Meeting opened at 9 a. m.

The President. — Gentlemen, the first item on our agenda is the final approval of the summaries for Question XIII the subject matter of which was agreed yesterday. Consequently, it means reading them a second time.

Can I take the Summaries adopted yesterday at their first reading, the text of which was given in this morning's *Daily Journal*, as adopted? (*Agreed.*)

I must however advise you that certain members asked me to make slight alterations to Summaries Nos. 5 and 10. Consequently, I think we should put the Summaries provisionally adopted yesterday to the vote one by one.

— *Summaries Nos. 1, 2, 3 and 4 were put to the vote in turn and adopted.*

— *Summary No. 5.* — Text drafted at the Meeting of September 26th.

« Measured packing cannot obviously be applied when it is a question of lifting a track considerably. Measured packing is technically better than beater packing; it is more economical (the output per man is at least doubled), provided skilled labour is available and the cost of the ballast is low.

« On account of greater accuracy, measured packing is particularly desirable where speeds are high.

« There is a tendency to adopt measured packing generally where the organization is on a sound financial basis. »

The President. — Our colleague Mr. COURSIN has asked me to modify the text of this Summary. He would like the words « stable and conscientious » to be added after « labour », so that the text will read : « ...provided stable, conscientious and suitable trained labour is available... »

Mr. Masseron. — I should like the text of this Summary to be completed by saying : « Levelling by measured shovel packing is technically better than hand tamping... » adding « hand ».

It seems to me in fact that it is a good thing to make it clear that where shovel packing cannot be used as the work is on too large a scale, mechanical tamping by machine gives excellent results.

The President. — We will therefore say that in the case of small lifts, shovel packing is technically better than tamping by hand.

It must also be noted that levelling by shovel packing cannot be used in the case of large lifts.

Mr. Coursin. — I would also like to suggest a modification, by saying : « Mechanical tamping by large machine for compressing and vibrating the ballast levelled by sighting telescope is to be preferred when the track has to be raised considerably ».

In fact there are several methods, and on our system at any rate, small tamping machines have not given satisfactory results, whilst large compressing and vibrating machines have given excellent results.

It seems to me that this alteration makes the text clearer.

Mr. Ripert. — I suggest saying « is to be recommended » instead of « preferred ».

Mr. Coursin. — Agreed.

Mr. Train (*British Railways*). — I would agree with that, but would prefer

to leave out the word « large » in front of « machines ». I would prefer to use just the word « machines ».

Mr. Masseron. — There are perhaps some tamping machines, which do not give such good results, but the large machines certainly give the best results.

Mr. Train. — That may be so. I claim that in Great Britain they still give results, perhaps not so good as large machines. I would not like them to be excluded.

I would like the word « large » before « machines » to be deleted and although the small machines do not give so effective results as the large machines, nevertheless they do give results; therefore I would prefer to delete the word «large».

The President. — If we said : « preferably by large machines... »

Mr. Train. — Agreed.

Mr. Ripert. — I think it would be better to begin the sentence like this : « Shovel packing, technically better than tamping by hand, etc... » And then « ...is not applicable in the case of large lifts » and then go on to speak of mechanical tamping.

As worded, the first sentence seems to imply that we condemn shovel packing, when quite the contrary is true.

Mr. Protat. — Would it not be better to replace « stones » by « gravel ».

The President. — Gentlemen, I want to call your attention to the danger of being too fussy. I think the text is sufficiently

clear, and that our common wish is seen quite clearly from the exchange of views, which took place yesterday and is being continued to-day.

I suggest wording this *Summary No. 5* as follows, according to the comments made :

« 5. Measured packing is technically superior to hand tamping in the case of small lifts : it is more economical (the output per man is at least doubled) provided skilled, conscientious permanent staff are available and provided also that the cost of chippings delivered to the site is not prohibitive. Measured packing cannot be applied where large lifts are made. In this case, mechanical tamping, preferably with large machines (compression and vibration), followed by the use of sighting boards, is recommended. »

This takes into account all the modifications suggested. (*Agreed*). As no one else wishes to say anything, I will put this new text to the vote.

— *Adopted*.

The President. — We will go on to the following summaries.

— *Summaries Nos. 6, 7 and 8 were put to the vote in turn and finally adopted.*

Summary No. 9 (text proposed) :

« 9. The question of replacing small gangs by larger gangs maintaining longer lengths and the problems of lodging and transport of personnel must be considered specially in every case. The organization of large gangs generally permits an overall reduction of manpower. »

Mr. Train. — I would like to have seen the word « mechanized » added there, i. e. « The question of replacing small gangs by larger mechanized gangs maintaining longer lengths... »

The President. — In my opinion this idea is dealt with in Summary No. 11, and I do not see the need for this addition.

— *The text of Summary No. 9 was approved without modification.*

Summary No. 10 (text drafted the day before) :

« 10. The introduction of bonuses does in fact provide an incentive in practice. It is difficult to establish the basis on which such bonuses should be based. »

The President. — As regards Summary No. 10, our colleague Mr. TRAIN suggests adding that as far as this question is concerned we are still in the experimental stage.

Mr. Train. — I think that as it stands it makes it appear that there is nothing to be done. This is not so.

The President. — I would like to point out that this is not a Summary. Certain railways are trying to solve the question in a relatively scientific way.

Mr. Masseron. — If we said : « In the present state of the question, it is difficult to define a method. Certain railways are making trials in this connection. »

The President. — This exchange of views shows that we are still in the trial

period. I suggest saying : « The problem is under investigation at the present time in various countries. »

Mr. Train. — Agreed.

The President. — The text will therefore read.

« 10. The introduction of bonuses does in fact provide an incentive in practice. It is difficult to establish the basis on which such bonuses should be based. This problem is now the subject of studies in several countries. »

— *Adopted.*

Mr. Ripert. — To give to the Meeting further details, I wish to mention various bases for the allocation of *output premiums*.

These are based :

A. Both on the quantity and the quality of the work done divided up :

a) on collective and individual bases :

— S. N. C. F. — Light Railways.

b) on a collective basis only :

— Tunisian and Swedish Railways.

c) by employee :

— French Northern Light Railways.

B. On the output for particular works, dividing them up by employee for the small gangs and on a collective basis for the large ones :

— Secondary Railways of the North-East (France).

C. By a classification between the districts and cantons according to the quality of the work :

— Portuguese Railways, Victoria and Sudan Railways.

The President. — I thank Mr. RIPERT for these details.

We still have to adopt *Summary No. 11*.

— *Adopted without comment.*

The Section then went on to discuss Question XIV.

DISCUSSION AT THE PLENARY MEETING.

Meeting held on September 29th, 1950.

DR. ENG. G. DI RAIMONDO, PRESIDENT, IN THE CHAIR.

GENERAL SECRETARIES : MR. P. GHILAIN AND DR. ENG. M. VALDIVIESO.

ASSISTANT GENERAL SECRETARY : MR. CH. E. WHITWORTH.

Mr. Ghilain, General Secretary (in French). — We will now examine the Summaries relating to Question XIII, which were published in the *Daily Journal of the Congress*, No. 2 of the 27th September 1950 and No. 3 dated 28th September 1950.

(No objections were raised during the examination of these Summaries.)

The President. — We may therefore consider the Summaries for Question XIII as adopted.

SUMMARIES.

« 1. The view is almost unanimous as to the efficiency of systematic maintenance; most of the systems have replaced haphazard maintenance by various methods of periodic overhaul :

« a) *General overhaul* of certain sections according to a programme, accompanied by *partial repairs* on some other parts of the system;

« b) *Complete overhaul* of certain sections according to a programme accompanied by a programme of *reduced overhaul* of other sections and by *partial repairs* elsewhere.

« 2. The lengths of the cycles of

« repairs vary between 2 and 6 years according to climatic conditions, and the nature of the ballast, and are dependent on the necessity for altering the permanent way for new traffic conditions.

« In cases where the length of the cycle is 2 years, the tendency is to try to increase the length of the period.

« 3. The rails and sleepers on certain sections are renewed annually.

« 4. Various satisfactory methods are used for the conservation and consolidation of the material, in particular :

« restamping the fishplates or inserting packings;

« welding rail joints and building up the frogs of crossings;

« re-using damaged holes in the sleepers by using wooden pegs and drilling the pegs, or by using packings or wedges;

« conserving the bearing surfaces by the use of sole plates or wooden bearing plates;

« binding split sleepers;

« maintaining the gauge on curves of small radius by the use of wedges, stops, plates, cleats or ties.

« 5. Measured packing is technically
« superior to hand tamping in the case
« of small lifts : it is more economical
« (the output per man is at least doub-
« led) provided skilled, conscientious
« permanent staff are available and pro-
« vided also that the cost of chippings
« delivered to the site is not prohibitive.

« Measured packing cannot be applied
« where large lifts are made. In this
« case mechanical tamping, preferably
« with large machines (compression and
« vibration), followed by the use of
« sighting boards, is recommended.

« 6. The correction of the alignment
« by the versine method with a calcula-
« tion of the errors and marking the cor-
« rect position, used by many railways
« (sometimes with the assistance of a
« calculating machine) makes it possible
« to get regular curves without proceed-
« ing by trial and error on the site.

« 7. Chemical weed-killing is replac-
« ing hand weeding on most railways;
« the most usual weedkiller is chlorate
« of soda in solution in water, or pure,
« or mixed with other salts. Never-
« theless in tropical regions this process
« is ineffective due to the high rainfall

« and flame throwers are substituted in
« some cases.

« 8. All the railways prepare mainten-
« ance programmes and check the way
« these are carried out by preparing
« graphs or tables.

« 9. The question of replacing small
« gangs by larger gangs maintaining
« longer lengths and the problems of
« lodging and transport of personnel
« must be considered specially in every
« case. The organization of large gangs
« generally permits an overall reduction
« of manpower.

« 10. The introduction of bonuses
« does in fact provide an incentive in
« practice. It is difficult to establish
« the basis on which such bonuses
« should be based. This problem is
« now the subject of studies in several
« countries.

« 11. The general tendency is to
« mechanize tools and equipment and
« this considerably increase output. In
« certain colonies besides, mechaniza-
« tion is essential in order to conserve
« manpower. Mechanization does not
« necessitate specially skilled manpower.

QUESTION XIV.

Change-over from steam-locomotive traction to Diesel traction.

Preliminary documents.

Report (America (North and South), Burma, China, Egypt, Great Britain and Northern Ireland, Dominions, Protectorates and Colonies, India, Iran, Iraq, Malay States and Pakistan), by A. W. OLIVIER. (See *Bulletin* for June 1950, p. 1419, or separate issue No. 29.)

France and Colonies, Greece, Hungary, Italy, Yugoslavia, Luxemburg, Norway, Holland and Colonies, Poland, Portugal and Colonies, Rumania, Sweden, Switzerland, Czechoslovakia and Turkey), by M. DIEGOLI. (See *Bulletin* for September 1950, p. 1927, or separate issue No. 39.)

Report (Austria, Belgium and Colony, Bulgaria, Denmark, Spain, Finland,

Special Reporter : U. CANTUTTI. (See *Bulletin*, October 1950, p. 2147.)

DISCUSSION BY THE SECTION.

Meeting held on September 27th, 1950.

PRESIDENT : MR. W. A. VRIELYNCK.

The President (in French).— Gentlemen, we now have to discuss Question XIV.

Before calling upon the Special Reporter, I would like to point out that the subject has been divided into three chapters : train locomotives, shunting locomotives and loco-tractors, and railcars.

Our Section is concerned with light and colonial railways; however, the main line railways also answered the questions, which are not without interest for them. We obtained some very valuable information from their replies. Consequently, we are dealing with this question from the point

of view of main line railways as well as light and colonial railways.

Does the Meeting agree that the summaries dealing with train locomotives, shunting locomotives and railcars are applicable to main line railways as well as light and colonial railways? (*Agreed.*)

Having made these preliminary remarks, I now call upon the Special Reporter.

Mr. Cantutti, *Special Reporter* (in French). — Gentlemen, I must stress the fact that the replies received from the different Administrations were neither

uniform nor complete. This is quite understandable in view of the fact that the machines with which we are concerned are in the experimental stage on most railways.

Consequently, it will be appreciated that the Reporters encountered certain difficulties in summing up the results of their enquiry and in drawing up general conclusions.

In view of the extent of the subject, it appears advisable to divide it into three chapters :

- A. Train locomotives;
- B. Shunting locomotives;
- C. Railcars.

Actually these three types of Diesel traction machines are very different, both as regards their characteristics : speed and tractive effort, and their use. In addition, the requirements of the different railways also differ. We found, for example, that on certain railways where the stations are very far apart, interest is focused on train locomotives. I will mention for example the American Railways. On other systems, especially the European railways, the stations are only a some ten kilometres apart, so that there is not the same interest in Diesel train locomotives. On the other hand the development of Diesel railcars and shunting locomotives has been quite remarkable.

The substitution of Diesel traction for steam traction is the result of very differing circumstances, for example :

1) the need to increase the power of the locomotives in spite of a light permanent way;

2) the organisation of a more flexible

service in order to make the fullest possible use of the traction units;

3) difficulties due to the climate or in obtaining water or fuel;

4) the need to reduce operating costs.

It may happen that the use of Diesel traction depends on yet other circumstances, such as the need to organise more attractive services; the necessity to compete against road transport by offering more flexible and faster services.

As regards those railways which have no Diesel train locomotives in service, the Diesel has been found very useful for intermittent services (shunting, or occasional goods transport), especially when it is possible to use such machines in multiple units. Although Diesel traction is still in the initial stages on the colonial railways, it can reasonably be affirmed that it is expected to develop very rapidly owing to the special conditions prevailing in such regions where the technical difficulties like those already mentioned are even greater.

The Reporters extended their enquiry to other non-colonial countries, such as America, and European countries.

In order to put before you some interesting facts, which can be discussed, the Summaries which I am going to read you have a very general character. They can serve as an indication of the tendencies observed on the different railways.

I am sure you will agree with me that it would be extremely difficult to formulate any more detailed Summaries from the reports although these were so circumstantial.

I hope, Gentlemen, that the discussion of these Summaries will enable us to give them the desired technical precisisions.

The President. — We will begin with *Chapter A : Train locomotives.*

Will the Special Reporter please read the first Summary.

Mr. Cantutti. — *Summary No. 1 :*

1. Diesel train locomotives have already, from the technical point of view, been sufficiently perfected for use in the normal railway services with a degree of safety and regularity comparable in practice to that given by the steam locomotive.

The President. — Does the Meeting agree with this wording?

Mr. Bosc, *Chemins de fer de l'Afrique occidentale française et du Togo* (in French). — I am not actually a member of this Section, but I would be very much obliged Mr. PRESIDENT, if you would allow me to say something about this question.

The Reporter was not told of the experience of our system, through our own fault. At the present time, we have 15 Diesel locomotives in service; we have as many again on order and now being delivered.

I would simply like to call the attention of the Meeting to two points which seem to be essential : first of all, it is a question of making a comparison between steam locomotives and Diesel locomotives, and to begin with it, it is essential to compare the cost of fuel in the different countries, especially in America, France, Algeria and in the so-called colonial countries. It will be found that there are such great differences in the cost of fuel that the summary could be perhaps not reversed, but in any case modified.

I will give you some examples : in Dakar and along the whole of the North African coast fuel oil costs 10 francs per kg while coal costs 6, 7, 8 and 9 francs. In Madagascar, oil costs 20 francs per kg whereas coal is very much cheaper. I consider therefore that the cost of fuel is a very important factor, which we should take into account.

The President. — We might discuss this matter later on. It seems to me that it does not affect the first summary, and we will be considering the cost of fuel later on.

Mr. Bosc. — Agreed. Secondly, I think that, at least in the case of the Colonial Railways, there is no point in making a distinction between train locomotives, shunting locomotives and railcars. To give the summary its full value it should cover both train and shunting locomotives. But I think this question has been dealt with by another section. Should not that Section be the one to draft the summary?

The President. — The Summary states precisely that «Diesel train locomotives have already, from the technical point of view, been sufficiently perfected for use in normal railway services». I take it that you agree with this definition?

Mr. Bosc. — I entirely agree with it, I am only raising the question of the cost of fuel, and consequently of the cost price, which dominates operating conditions in the colonies.

The President. — As no one else wishes to say anything in connection with

Summary No. 1, I will put the matter to the vote.

— *Summary 1 was adopted without modification.*

The President. — Gentlemen, instead of going on to discuss Summary No. 2, I propose that first of all we consider *Summary No. 4* which deals with technical considerations. (*Agreed.*)

Will the Special Reporter please read Summary No. 4.

Mr. Cantutti. — *Summary No. 4 :*

4) Diesel locomotives can be used as multiple units, driven by one man.

The President. — Any comments?

As no one wishes to say anything, I declare this Summary adopted.

Mr. Cantutti. — I would like to point out that in general it is found that the standard types for operating in multiple units have 1 000 to 1 500 or even 2 000 HP engines. It is therefore possible to couple up 2 or 3 units. For example in the United States, a rake of three 2 000 HP units is quite common; this gives a power of 6 000 HP.

I think it would be interesting to make an addition to this paragraph, stating that the most usual units are 1 000 to 2 000 HP units for standard gauge lines and 800 HP for narrow gauge lines. The latter are generally coupled up in pairs, which gives 1 600 HP.

The President. — Does this only apply to the main line railways? Does it also apply to the light railways?

It must also be made quite clear : do we mean engine power or the power at the rail?

Mr. Cantutti. — Generally, it means the power at the rail.

The President. — We must obviously start from the same basis.

Mr. Cantutti. — There are Diesel locomotives with 600 to 1 350 HP engines which obviously do not develop this power at the rail.

The President. — This is a very important point, and it seems to me that the Summary should be completed in this way.

Does the Meeting agree that we say : « The most usual size units are from 1 000 to 2 000 HP for standard gauge railways and 800 HP for narrow gauge railways .»

Mr. Barbaut, Compagnie Fermière des Chemins de fer tunisiens (in French). — I would like to ask a question. It has been stated that rakes of Diesel-electric locomotives are used, especially in Africa, consisting of 2 to 3 locomotives with a power of 2 000 HP.

Is it always taken for granted that there is only one man driving the train with these 2 or 3 Diesel-electric locomotives? Or does this driver have assistants to look after the other locomotives?

This point is of considerable importance from the point of view of the savings expected from the method.

Mr. Cantutti. — From the information in my possession, only one man is required. If there is more than one man, this is not for technical nor safety reasons but rather for social reasons.

The President. — Is the dead man's handle used?

Mr. Cantutti. — Not always.

The President. — Normally these rakes are driven by one man only?

Mr. Cantutti. — Yes, these coupled locomotives can be driven by one man. Up to the present I do not know of any other railways where this method is used.

The President. — Amongst those present are there the representatives of any other railways using locomotives of this power? I am speaking of Diesel locomotives with electric drive, driven by one man.

Are there any American delegates present? (*No.*)

The most complete solution is actually to be found in America.

Mr. Barbaut. — I can state that in America there are always two men.

The President. — In fact, a spare driver, who can take over.

Mr. Barbaut. — For safety reasons also.

The President. — Perhaps, this is because the distances are so much greater.

Mr. Barbaut. — Perhaps, it is possible to assure the service with only one man, but I have found on the different railways that there are always two men.

The President. — What would be interesting would be to discover if the second man is there as a spare driver or to check the other locomotives during the run.

Mr. Barbaut. — As far as our railways are concerned, we have not yet had sufficient experience. We are still in the trial period. We employ in addition to the driver a man to look after the locomotives.

In Algeria, there are also two men. But it is not yet certain whether we shall continue to use two.

Mr. Richelot, Office d'Exploitation des Transports Coloniaux « OTRACO », Belgium (in French). — I suggest saying in the Summary that in the case of narrow gauge lines, the most usual units are 600 to 1 500 HP.

The President. — Does the Meeting agree to Mr. RICHELOT's suggestion? (*Agreed.*)

Taking this exchange of opinions into account, regarding the number of men per train, and the power of the locomotives on narrow gauge lines, I suggest that *Summary No. 2* be worded as follows :

« 2. It is possible with Diesel locomotives to use several single units coupled together, driven by one man. In practice up to the present time it has been found preferable to employ at least two men

per train. For standard gauge railways the most usual size unit is from 1 000 to 2 000 HP and on narrow gauges from 600 to 1 500 HP. »

No objections?

— *This text was adopted for Summary No. 2 to replace the former Summary No. 4.*

The President. — I now propose to consider *Summary No. 2 of the Special Report.*

Mr. Cantutti. — *Summary No. 2 (new No. 3) :*

2. The most important factor to be considered however is the economic side, which is greatly influenced by the high purchase price and higher amortisation charges, which can, however, be partially compensated by a very high utilisation coefficient, but above all by the price of fuel which varies considerably from one country to another.

This latter reason and the special characteristics of the service to be operated and the countries, in which they are run, are today the fundamental factors which can lead to a widely different development of Diesel traction, both as regards its importance, and the constructional types.

Mr. Bosc. — I suggest we leave out in the fifth line the word « partially ». Actually, it is sometimes « partially » but also sometimes « totally ».

Mr. Barbaut. — The word « beaucoup » (a lot) in the 8th line, seems rather feeble to me. I would prefer « considerably ».

The President. — Does the Meeting agree to this text with these two modifications? (*Agreed.*)

— *The text amended in this way was*

adopted as the new Summary 3, reading as follows :

« 3. The most important factor to be considered however is the economic side, which is greatly influenced by the high purchase price and higher amortisation charges, which can, however, be compensated by a very high utilisation coefficient, but above all by the price of fuel which varies considerably from one country to another.

« This latter reason and the special characteristics of the services to be operated and the countries in which they are run, are today the fundamental factors which can lead to a widely different development of Diesel traction, both as regards its importance, and the constructional types. »

Mr. Cantutti. — Here is the text of *Summary No. 3 of the Special Report (new No. 4) :*

3. In the United States of America the construction of steam locomotives has practically been given up in recent years in favour of Diesels. In some African and Colonial countries, the local conditions are particularly favourable to the development of this method of traction; in other countries, especially in Europe, the question has not developed any definite tendencies to date.

Mr. Ferreira, Benguela Railways (in French). — I think this Summary should be modified, as it appears to me to contradict the previous Summary to some extent. We want to make a distinction between the position in the colonies and in Europe, because the use of the Diesel depends on economic conditions and the cost of fuel. This has already been very clearly stated.

I do not think it is necessary to make a distinction between Europe and Africa. It is the local conditions — alone — which decide the matter. In this connection, I might quote Portugal as an example. For the last two years, the Portuguese Railways Company (C. P.) have experimented very successfully with the Diesel, which enables to make appreciable economies and increases the speed of transport.

On the other hand, in Africa, the Benguela Railway which operates 1 300 km of lines uses steam locomotives and will continue to use them since a recent order for several steam locomotives is now being completed. The reason for this is to be found in the use of native timber for fuel, which gives very appreciable savings in view of the scarcity of coal. I might add that the Benguela Railway has an operating coefficient of about 60 %.

Local conditions consequently are the decisive factor and, in certain regions, the use of steam locomotives has advantages which the Diesel cannot offer.

The President. — This confirms what Mr. Bosc said just now. Owing to these comments, I think the Summary should be made more general without mentioning the colonies.

Mr. Van Lierde, *Principal Secretary* (in French). — On the contrary, it seems to me that the Summary should be added to. This exchange of opinions makes it clear that there is a definite tendency towards the Diesel in the United States.

In the case of the colonies, it depends on certain local circumstances. In the

case of Europe, there is no such definite tendency.

The President. — This is not a very definite summary; it is in fact a simple statement. I would suggest a more general text in which it will be stated that in countries where oil is cheap, the steam locomotive will inevitably give way to Diesel traction, as for example it is already the case in the United States of America.

The rest of the Summary could be left as it is.

Mr. Bosc. — Perhaps, this is making rather too much of the question of fuel. Fuel is obviously at the bottom of it, but all the other technical considerations, which are thoroughly gone into in the report, also come into the picture.

The President. — But it would be simply a statement of fact.

Mr. Van Lierde. — The Summary might begin by a statement of fact, for example by saying: « In the present state of affairs... »

The President. — Unless we speak of locomotives in general, since it is also a question of electrification although this is not the subject of this Summary.

We might perhaps say: « In countries where hydraulic power is cheap, or where power plants can be built at the collieries, the tendency of the main line railways with heavy traffic and frequent services is towards electrification ».

Mr. Bosc. — It seems to me that this goes without saying and lies rather outside our field.

The President. — Yes, but Diesel traction and steam traction are being compared, and we seem to be overlooking electrification. We seem to imply that no other solutions are possible.

Mr. Van Lierde. — Up to the present, there has been no well defined tendency, precisely on account of the possibilities of electrification. Is there a tendency for lines with heavy, dense traffic to be electrified?

Mr. Ferreira. — In several European Countries.

Mr. Van Lierde. — In Germany, the tendency is not towards electrification. The Diesel is preferred, even on lines with heavy traffic.

The President. — Yes, but Germany is a country with rich coal resources.

Mr. Ferreira. — Even in the case of lines with much traffic and frequent services?

Mr. Van Lierde. — Yes.

The President. — I think it would be better not to go into too many details in this connection.

Mr. Van Lierde. — We can state the causes, without pointing out the tendencies.

Mr. Bosc. — It is clear that there is as yet no well defined tendency. Moreover, it seems to me that this is not the subject with which we are concerned.

The President. — On account of the different views on this question, I suggest we leave the Summary unaltered. (*Agreed.*)

Summary No. 4 will therefore be worded as follows :

« 4. In the United States of America the construction of steam locomotives had practically been given up in recent years in favour of Diesels. In some African and Colonial countries, the local conditions are particularly favourable to the development of this method of traction; in other countries, especially in Europe, the question has not developed any definite tendencies to date. »

— *Adopted.*

The President. — This brings us to *Chapter B : Shunting locomotives.* Will the Special Reporter please read the first Summary for this chapter.

Mr. Cantutti. — *Summary No. 1 :*

1. In European countries, Diesel shunting engines can be divided into three categories as regards power, according to the work for which they are designed :

(a) 50 to 100 HP for shunting vehicles and engines in the sheds, shops and small stations;

(b) 150 to 300 HP for shunting in the average sized stations;

(c) 400 to 700 HP for heavy shunting operations and for use in the large marshalling yards.

The President. — Any comments?

Mr. Bosc. — I suggest to leave out the words « In European countries ». The Summary will then begin as follows : « Diesel shunting engines ».

The President. — No objections to this suggestion? (*No, No.*)

Therefore, I put this Summary to the vote, it is understood that we delete the first words : « In European countries ».

— *Adopted under No. 5 as follows; the Bureau having decided to give a continued numbering for all the Summaries.*

« 5. Diesel shunting engines can be divided into three categories as regards power, according to the work for which they are designed :

« a) 50 to 100 HP for shunting vehicles and engines in the sheds, shops and small stations;

« b) 150 to 300 HP for shunting in the average sized stations;

« c) 400 to 700 HP for heavy shunting operations and for use in the large marshalling yards. »

The President. — We now come to Summary No. 2 of the original text.

Mr. Cantutti. — *Summary No. 2 :*

2. In Europe, Diesel shunting engines are fairly widespread, and locotracors are used to a considerable extent already, whilst in the United States only locomotives are used.

The President. — We might perhaps add something to this text, which is a statement of fact.

I have read on this subject in the *Revue générale des Chemins de fer*, for August

1949, a part of a report by Mr. PARMENTIER, worded as here after :

« The advantages of the Diesel locomotive for shunting in stations and marshalling yards are universally admitted nowadays... As flexible in use as the electric locomotive, the Diesel-electric locomotive lends itself particularly well for use with private industrial and quayside sidings; *recent studies have shown that even on an electrified railway, Diesel shunting locomotives in certain cases are better than electric locomotives*, as they make it unnecessary to equip any considerable extent of sidings with contact lines ».

I am of the opinion that generally speaking the shunting locomotive will come into general use, on all the railways, whatever their nature and whatever their importance.

Obviously, it will not be a very powerful locomotive; but on the contrary a very low powered locomotive.

Do you not think that we might add this idea to the Summary?

Mr. Bosc. — In my opinion, the Summary should be made rather more general. We are all agreed I think that Diesel locomotives and loco-tractors should be used for shunting. In fact, the only differences concern the type of transmission. What you call « locomotives », are large locomotives. But I do not think the small locomotives should be left out of the picture.

The President. — Naturally, I do not want to leave the small powers out, quite the contrary.

Mr. Bosc. — We might say that loco-tractors or Diesel locomotives are being used more and more for shunting.

The President. — If the Meeting agrees, the text of this Summary will therefore read as follows :

« At the present time the tendency is to use the Diesel shunting locomotive or Diesel loco-tractor on all the railways, whatever their importance and nature. » And we will add : « In Europe, Diesel shunting engines are widely used and loco-tractors are used in considerable numbers ».

Mr. Van Lierde. — These are statements, and it is the tendency which is the important thing. It seems from what we have just heard that the tendency is to generalise the use of the Diesel.

Mr. De Backer, *Ministère des Colonies, Belgium* (in French). — We seem to be speaking solely from the European point of view, whereas these statements also apply to the colonies.

The President. — I agree that we should delete the first words : « In Europe ».

So that the final text of this Summary will read :

« It would appear that in practice the tendency is to standardise the use of Diesel shunting locomotives on all Administrations whatever their importance and nature. »

No more comments? I will therefore put this text to the vote.

— *Adopted as new No. 6.*

The President. — We will go on to the next Summary (former No. 3).

Mr. Cantutti. — *Summary No. 3 :*

3. For the types of the 3rd category Diesel locomotives with electric drive are generally used, though this does not exclude the hydraulic drive; in the case of the other two categories mechanical drive seems to be most widely used in view of the particularly favourable cost price, whereas the electric and hydraulic drives are more flexible in service.

The President. — I should like to ask the Meeting if any of those present use 300 HP locomotives with electric drive?

Mr. De Busschere, *Chemins de fer du Bas-Congo au Katanga* — We have in service two 1 350 HP Diesel-electric locomotives (two 675 HP engines) of American construction.

We put this order up to tender. The Americans seemed the best at the time, and they got the order. In fact, shortly after the war it was not possible to buy them in Belgium. The Americans suggested the use of the electric drive which had undergone its tests. We adopted it.

The President. — Is there not a tendency to use mechanical transmission up to powers of 500 HP?

Mr. Bosc. — In 1936, we began to use 300 HP railcars with mechanical drive and railcars with electric drive built by the same firm. We did this because at the time we were not absolutely sure about the efficiency of the mechanical drive on difficult sections.

The results obtained showed that the

mechanical transmission of these railcars — even after 15 years — gives results at least as good as those obtained with electric drive.

At the present time, our policy is to develop mechanical transmission.

In the case of higher powers, we use at the present time what we call « power brake vans » of 600 HP (two 300 HP engines). Probably, we shall shortly be calling for tenders for 900 HP locomotives with mechanical drive, probably with two engines with two drives.

The President. — You are therefore going to increase the power to 900 HP.

Mr. Bosc. — We are not overlooking this possibility.

The President. — I think therefore we might say that on the one hand in the case of powers below 500 HP the tendency is towards mechanical drive; and on the other, as regards this mechanical drive, there is also a tendency to make use of torque converters. In the case of higher powers, hydraulic drives might be considered.

Mr. Richelot. — In America, Diesel-electrics alone are used.

The President. — Do any of those present use mechanical drives with torque converters? It does not appear that there has been much experience in this field at the present time. I think however that there is a tendency to make use of them.

If you agree, we might word the Summary in such a way as to state that in

the case of powers below 500 HP the tendency is to adopt mechanical drive with the use of torque converters.

Mr. Richelot. — This is true of Europe but not of America.

The President. — Perhaps, because of the need for specially trained staff?

Mr. Richelot. — It is used even with low powers.

The President. — I really wonder why. Your economic conditions are very much the same.

Mr. Richelot. — I know that in America, even in the case of low powers, electric drive is nearly always used.

The President. — Do you use the electric drive more than any other kind?

Mr. Richelot. — We have just given an order for locomotives identical to those already in service, i.e. with electric drive. We were offered some hydraulic drives, as hydraulic transmission is beginning to be used in America. But at this time, there are not many applications of this method in America itself.

The President. — I really do not understand why conditions should be different in Europe and America.

Mr. Cantutti. — The reason for this seems to me to be as follows : the great obstacle to the electric drive is its high cost. In the United States, where mass

production is possible, purchasing conditions are different. The great handicap of the electric drive, i.e. its very high cost, disappears owing to mass production.

Mr. Richelot. — There is in fact 20 to 25 % difference in cost between the electric and the hydraulic drive.

Mr. De Busschere. — There is another reason why the same engine can give different results in Europe and in America, and that is the lower professional skill of the drivers.

We tried mechanical drives and we had some trouble. I do not condemn the mechanical drive on this account, as from our experience a lot of this trouble can be attributed to the lack of training of the native drivers in the colonies, in spite of all our attempts to make them mechanically minded.

The President. — The trouble experienced was probably in connection with the gears?

Mr. De Busschere. — Yes. The drivers do not change speed when they should. They are too rough with the gears.

The President. — Does the Meeting agree to the following addition: « For powers below 500 HP, the tendency is to adopt mechanical drive with torque converters ».

This is merely a tendency. It does not mean that it must be adopted at the present moment. (*Agreed.*)

The final text will therefore read:

« For the types of the 3rd category,

Diesel locomotives with electric drive are generally used, though this does not exclude the hydraulic drive; in the case of the other two categories, mechanical drive seems to be most widely used in view of the particularly favourable cost price, whereas the electric and hydraulic drives are more flexible in service.

« Below 500 HP the tendency is to adopt mechanical transmissions with torque converters. »

I will put this text to the vote.

— *Adopted as new No. 7.*

Mr. Cantutti. — *Summary No. 4:*

4. Diesel shunting engines work very satisfactorily, and can be driven by one man and used as multiple units.

The President. — This idea is already implicitly implied in a previous Summary. In my opinion we could suppress this latter Summary.

Mr. Bosc. — I quite agree.

— *Summary No. 4 is suppressed.*

Mr. Cantutti. — *Summary No. 5:*

5. The coefficients of availability and utilisation of Diesel shunting engines are higher than those for steam traction, whilst the operating costs are definitely lower.

The President. — Has anyone anything to say about this text?

— *Adopted without comment as new No. 8.*

Mr. Cantutti. — *Summary No. 6:*

6. The use of locotracors is particularly indicated from the point of view of economy, to replace steam locomotives for light or

intermittent shunting operations, or, on secondary lines, to haul stopping goods trains and carry out all the necessary shunting operations involved.

Mr. Bosc. — I suggest suppressing this Summary because we are now dealing with shunting locomotives and the Summary ends by considerations relating to stopping trains.

The President. — The difficulty is to know in what class loco-tractors should be used, i.e. little locomotives.

Mr. Bosc. — We spoke of the tendency for shunting locomotives.

The President. — Yes, but we are now considering goods services on light railways. Where the goods traffic is not very important, the present tendency is to use loco-tractors to haul the goods trains.

Mr. Bosc. — I think this is dealt with in the first paragraph.

The President. — But the case is rather different. In my opinion, Chapter B: « Shunting locomotives » should be called « Shunting locomotives and loco-tractors ». Loco-tractors being taken to mean small locomotives which can be used for the passenger services, but which are of such type and power that they can also haul goods trains and small stopping trains.

Mr. Bosc. — Are we all going to agree about this definition of a loco-tractor?

The President. — It is obviously a matter of convention. It seems however

that we cannot include these small power railcars amongst the train locomotives.

Mr. Bosc. — Why not! In my opinion, the interest of the Diesel lies in the Diesel engine, whether this is of small or high power. Its advantage compared with the steam locomotive lies in its engine. As there are small steam locomotives, I do not see any need to have a special class for these small types of Diesels.

Mr. Cantutti. — But the speed characteristics of these small Diesel locomotives are something quite special. As far as we are concerned, as this is one of the ways in which we make the greatest use of them, we think the fact should be mentioned.

The President. — Is this practice limited to the secondary lines?

Mr. Bosc. — No, the light railways and secondary lines of the main line railways are concerned.

The President. — But even in the case of the main line railways, the secondary lines are usually light railways.

For my part, I see no disadvantage in retaining this Summary.

Mr. Vincent, *Chemins de fer secondaires du Nord-Est, France* (in French). — To make the discussions clearer, I would like to point out that we call loco-tractors small engines used in certain yards and generally used for shunting operations.

The President. — As we have already said, all this is a matter of convention.

It is not the same in our case. We call these railcars, tractors; others use different names for them. Mr. CANTUTTI, our Special Reporter, gave a different definition again. The loco-tractor has no exact definition.

Mr. Bosc. — A distinction must be made between loco-tractors used for train services and those used for shunting in the yards.

The President. — We also have railcar-tractors of about twice 180 HP. In fact, I think it is very difficult to define exactly what is meant by a loco-tractor.

Mr. Vincent. — The 5th Section deals in principle with light and colonial railways. So, are we therefore going to vote Summaries which in fact only concern the main line railways?

The President. — I agree. A distinction must be made. We are concerned essentially with light and secondary railways. We might say : « In the case of light railways, these loco-tractors are used normally to haul goods trains and for the necessary shunting in connection therewith, as well as for stopping passenger trains ».

Mr. Bosc. — In any case, we should retain after « for shunting of little importance » the words « or intermittent ».

The President. — Agreed. Under these conditions, the text of the Summary would read as follows :

« The use of light Diesel locomotives

is particularly indicated from the point of view of economy, to replace steam locomotives for light or intermittent shunting operations.

« In the case of light railways, light Diesel locomotives are normally used on goods trains, in which case they carry out the associated shunting operations — and on local passenger trains. »

Does the Meeting agree to this text? (*Agreed.*)

— *Adopted as new No. 9.*

The President. — This brings us to the discussion on the Summaries for *Chapter C : Railcars.*

Will the Special Reporter please read the first Summary on this subject.

Mr. Cantutti. — *Summary No. 1 :*

1. In European countries, railcars are used almost exclusively for passenger services on secondary lines, and even for fast long distance trains on the main lines.

In the United States, railcars seem to be used to a very limited extent on secondary lines, and their development does not appear to be likely.

In Europe, it should be noted that it is during recent years that the use of railcars has increased to such a rapid extent, and it appears likely that this development will continue owing to the favour it finds with the public and the operating advantages obtained, especially the flexibility and increase in the average speeds — above all on lines with heavy gradients or many stops.

In non-European countries, the use of railcars is often justified by reasons similar to those already mentioned in connection with Diesel train locomotives.

Mr. Bosc. — There seems to be a certain opposition between the words « almost exclusively for passenger services

on secondary lines » and the use of the expression « on the main*lines ».

I suggest saying : « Mainly » instead of « almost exclusively ».

The President. — The phrase : « railcars are used for passenger services » is the actual definition of the railcar.

Mr. Bosc. — Let us say rather : « and for fast services ».

The President. — Does the Meeting agree? (*Agreed.*)

With these amendments the text will then read :

« In European countries, railcars are used for passenger services on secondary lines and even for fast long distance services on main lines.

« In the United States, railcars seem to be used to a very limited extent on secondary lines and their development does not appear to be likely.

« In Europe, it should be noted that it is during recent years that the use of railcars has increased to such a rapid extent, and it appears likely that this development will continue owing to the favour it finds with the public and the operating advantages obtained, especially the flexibility and increase in the average speeds — above all on lines with heavy gradients or many stops.

« In non-European countries, the use of railcars is often justified by reasons similar to those already mentioned in connection with Diesel train locomotives.»

I will put this new text to the vote.

— *Adopted as new No. 10.*

Mr. Cantutti. — *Summary No. 2 :*

2. According to the type of service, two categories of railcars can be distinguished, i.e. the light type for economic services at moderate speeds, with a high degree of user, and the other for important services at higher speeds, with a greater specific power (10 and even 13 HP per tonne of full load) and offering greater comfort.

The President. — No comments? (*No, No.*)

— *Adopted as new No. 11.*

Mr. Cantutti. — *Summary No. 3 :*

3. Mechanical and hydraulic drives are the most usual in recent types; the engines are generally carried on the bogies and sometimes on the body.

Mr. Bosc. — This last statement is disputable. I think it would be better not to mention it.

The President. — I agree with you; it depends on the lines.

Mr. Bosc. — I suggest therefore that we suppress the last sentence : « the engines are generally carried on the bogies and sometimes on the body ».

The President. — Does the Meeting agree to this suggestion? (*Agreed.*)

The final text will therefore read as follows :

« 12. Mechanized and hydraulic transmissions are adopted most frequently in modern practice. »

— *This Summary was adopted as new No. 12.*

Mr. Cantutti. — *Summary No. 4 :*

4. The use of trailers, as well as coupling up in multiple units, is the general practice with the most recent types. Generally single control by one man is realised, and it is possible to pass from one unit to the other; the use of articulated rakes does not seem likely to develop on the same scale.

The President. — We might add : « There is also a tendency to use the railcar by itself, without a trailer ».

Mr. Bosc. — I do not agree.

The President. — It is true I am thinking of our own lines in Belgium where in order to take account of the great density of population, we have of necessity to run services at frequent intervals. The railcar is therefore used by itself.

It would be better not to mention it however. It is a special case.

Mr. Vincent. — It should be made clear that by « single control » the driving of the engine is meant. Our railcars are often driven by one man who drives the railcar and collects the fares.

Mr. Cantutti. — This was not what was meant. It is simply a question of the actual driving of the vehicle.

The President. — It is not therefore what is called in English : « a one-man car ».

The text of this Summary will therefore read as follows :

« 13. The use of trailers, as well as coupling up in multiple units, is the general practice with the most recent

types. Generally single control by one man is realised, and it is possible to pass from one unit to the other; the use of articulated rakes does not seem likely to develop on the same scale. »

— *This text was put to the vote and adopted as new No. 13.*

Mr. Cantutti. — *Summary No. 5 :*

5. The use of adhesion railcars has proved satisfactory even on lines with very heavy gradients (75 ‰).

Mr. Vincent. — 75 ‰ : that seems to me to be quite an exceptional performance. I would like to know if it is necessary to give any figure?

The President. — We could in fact leave this out. (*Agreed.*)

The Summary will therefore read as follows :

« 4. The use of adhesion railcars has proved satisfactory even on lines with very heavy gradients. »

— *This text was put to the vote and adopted as new No. 14.*

Mr. Cantutti. — *Summary No. 6 :*

6. The average life of railcars seems to be 15 years for the engines and 25 years for the body.

I would add that this is a method mentioned in the different reports. But it is a very debatable point.

Mr. Vincent. — What is meant by the « life of the motor »? It can be repaired by spare parts and even renewed completely after a certain time. This moreover is often done.

The President. — It is dangerous to quote this figure : perhaps it would be better not to mention it in a general Summary. I understand that several Delegates do not altogether agree and wish to make certain reservations on the matter.

Mr. Bosc. — Through lack of information.

The President. — I am wondering if this Summary does not contradict those already adopted.

Mr. Bosc. — It seems to me that we should say in a Summary that : « the advantages of Diesel traction are appreciable when it is used exclusively on certain sections, for train locomotives as well as for shunting locomotives and railcars ».

The President. — Does the Meeting agree to this suggestion? (*Agreed.*)

Consequently, I suggest drafting a Summary on these lines, which will be worded as follows :

« The maximum advantages of Diesel traction are realised when this form of motive power is introduced over entire sections of a system, both in the case of train locomotives and shunting locomotives, and also in the case of railcars ».

I put this Summary to the vote.

— *The Summary is adopted and becomes new No. 15.*

Mr. Cantutti. — *Summary No. 7 :*

7. In the case of future constructions, the tendency is to keep to a clearly defined classification of standardised designs.

The President. — The text of this Summary in my opinion is too general. Does the Meeting wish to retain it? (*No., No.*)

Under these conditions, I put to the vote the suppression of this Summary.

— *Summary No. 7 was suppressed.*

The President. — Gentlemen, this brings us to the end of the discussion on Question XIV.

We will not have to go over the Summaries which we have approved, as these were adopted in their final form. It remains for me to thank the Special Reporter, Mr. CANTUTTI for his excellent work and also all those Delegates, who took an active part in the debate.

I propose to-morrow to begin the examination of Question XV dealing with the signalling of single track lines. (*Agreed.*)

— The Meeting adjourned at 11.15 a.m.

Meeting of the 28th September 1950.

PRESIDENT : MR. W. A. VRIELYNCK.

The Meeting began at 9.10 a.m.

FUNERAL EULOGY

The President (*before the Meeting standing at attention*). — Gentlemen, I is my sorrowful duty to have to inform you of the sudden death of our colleague Mr. André LÉVY.

Mr. André LÉVY was a member of the Vth Section.

Our lamented colleague was for many years Head of the Commercial Department of the French North Railway. Latterly, he was Chairman and General Manager of the « Compagnie Générale des Voies ferrées d'intérêt local ».

Yesterday, Mr. LÉVY was present at the Meeting of our Section and took part in our works. During the Meeting, he suddenly felt indisposed and had to go home.

Mr. André LÉVY died suddenly during the afternoon.

Gentlemen, as our much grieved friend was a member of our Section, I propose to adjourn the Meeting as a sign of mourning. We will resume our work on Monday October 2nd.

I had not the honour of knowing Mr. LÉVY intimately, but all those who did know him have assured me that Mr. LÉVY was a man of brilliant qualities, very intelligent and full of energy.

The French Railways have lost one of their most able men.

I suggest, Gentlemen, one minute of silence in memory of our lamented Colleague.

— The Meeting adjourned at 9.20 a. m.

Meeting of the 2nd October 1950.

PRESIDENT : MR. W. A. VRIELYNCK.

— The Meeting began at 9.15 a. m.

The President. — Although all the Summaries for Question XIV were finally adopted at our last Meeting, I received a request from Messrs. CANTUTTI and OLIVIER (*Reporter*) to make a modification to *Summary No. 5*.

Their suggestion is to complete paragraph c) of Summary 5 as follows :

« c) 400 to 700 HP for heavy shunting and for use in large marshalling yards. *In the United States, this power is as much as 1 000 HP.* »

Does the Meeting see any objection to adopting the addition : « In the United States of America, the maximum is of the order of 1 000 HP » which is more-over a mere statement of fact? (*No, No.*)

Consequently I declare this modification adopted.

It will be submitted to the approval of the Plenary Meeting on Wednesday 4th October.

— The Meeting then went on to discuss Question XV.

DISCUSSION AT THE PLENARY MEETING.

Meetings held on September 29th and October 4th, 1950.

DR. ENG. G. DI RAIMONDO, PRESIDENT, IN THE CHAIR.

GENERAL SECRETARIES : MR. P. GHILAIN AND DR. ENG. M. VALDIVIESO.

ASSISTANT GENERAL SECRETARY : MR. CH. E. WHITWORTH.

Mr. Ghilain, General Secretary (in French). — We will now examine the Summaries relating to Question XIV, which were published in the *Daily Journal of the Congress*, No. 3 dated 28th September 1950.

(No objections were raised during the examination of these Summaries.)

The President. — We may therefore consider the Summaries for Question XIV as adopted.

— *Summary No. 5, which was modified afterwards at the Meeting of the Vth Session, on the 2nd October 1950, and which was published in the Daily Journal of the Congress No. 6, was ratified during the plenary Meeting of the 4th October 1950.*

The full text of the Summaries for Question XIV is the following :

SUMMARIES.

A. Train locomotives.

« 1. Diesel train locomotives have already, from the technical point of view, been sufficiently perfected for use in the normal railway services with a degree of safety and regularity comparable in practice to that given by the steam locomotive.

« 2. It is possible with Diesel locomotives to use several single units coupled together, driven by one man. In practice up to the present time it has been found preferable to employ at least two men per train.

« For standard gauge railways the most usual size unit is from 1 000 to 2 000 HP and on narrow gauges from 600 to 1 500 HP.

« 3. The most important factor to be considered however is the economic side, which is greatly influenced by the high purchase price and higher amortisation charges, which can, however, be compensated by a very high utilisation coefficient, but above all by the price of fuel which varies considerably from one country to another.

« This latter reason and the special characteristics of the services to be operated and the countries in which they are run, are today the fundamental factors which can lead to a widely different development of Diesel traction, both as regards its importance, and the constructional types.

« 4. In the United States of America the construction of steam locomotives had practically been given up in recent

« years in favour of Diesels. In some
 « African and Colonial countries, the
 « local conditions are particularly fa-
 « vourable to the development of
 « this method of traction; in other coun-
 « tries, especially in Europe, the question
 « has not developed any definite tenden-
 « cies to date.

B. Shunting locomotives.

« 5. Diesel shunting engines can be
 « divided into three categories as regards
 « power, according to the work for
 « which they are designed :

« a) 50 to 100 HP for shunting
 « vehicles and engines in the sheds,
 « shops and small stations;

« b) 150 to 300 HP for shunting in
 « the average sized stations;

« c) 400 to 700 HP for heavy shunt-
 « ing operations and for use in the large
 « marshalling yards. In the United
 « States of America, the maximum is of
 « the order of 1 000 HP.

« 6. It would appear that in practice
 « the tendency is to standardise the use
 « of Diesel shunting locomotives on all
 « administrations whatever their import-
 « ance and nature.

« 7. For the types of the 3rd cate-
 « gory, Diesel locomotives with electric
 « drive are generally used, though this
 « does not exclude the hydraulic drive;
 « in the case of the other two categories,
 « mechanical drive seems to be most
 « widely used in view of the particularly
 « favourable cost price, whereas the
 « electric and hydraulic drives are more
 « flexible in service.

« Below 500 HP the tendency is to

« adopt mechanical transmissions with
 « torque convertors.

« 8. The coefficients of availability
 « and utilisation of Diesel shunting
 « engines are higher than those for
 « steam traction, whilst the operating
 « costs are definitely lower.

« 9. The use of light Diesel locomo-
 « tives is particularly indicated from the
 « point of view of economy, to replace
 « steam locomotives for light or inter-
 « mittent shunting operations.

« In the case of light railways, light
 « Diesel locomotives are normally used
 « on goods trains, in which case they
 « carry out the associated shunting
 « operations — and on local passenger
 « trains.

C. Railcars.

« 10. In European countries, railcars
 « are used for passenger services on
 « secondary lines and even for fast long
 « distance services on main lines.

« In the United States, railcars seem
 « to be used to a very limited extent on
 « secondary lines and their development
 « does not appear to be likely.

« In Europe, it should be noted that
 « it is during recent years that the use
 « of railcars has increased to such a
 « rapid extent, and it appears likely that
 « this development will continue owing
 « to the favour it finds with the public
 « and the operating advantages obtained,
 « especially the flexibility and increase
 « in the average speeds — above all on
 « lines with heavy gradients or many
 « stops.

« In non-European countries, the use

« of railcars is often justified by reasons
« similar to those already mentioned in
« connection with Diesel train locomotives.

« 11. According to the type of service, two categories of railcars can be distinguished, i. e. the light type for economic services at moderate speeds, with a high degree of user, and the other for important services at higher speeds, with a greater specific power (10 and even 13 HP per ton of full load) and offering greater comfort.

« 12. Mechanized and hydraulic transmissions are adopted most frequently in modern practice.

« 13. The use of trailers, as well as

« coupling up in multiple units, is the general practice with the most recent types. Generally single control by one man is realised, and it is possible to pass from one unit to the other; the use of articulated rakes does not seem likely to develop on the same scale.

« 14. The use of adhesion railcars has proved satisfactory even on lines with very heavy gradients.

« 15. The maximum advantages of Diesel traction are realised when this form of motive power is introduced over entire sections of a system, both in the case of train locomotives and shunting locomotives, and also in the case of railcars.

QUESTION XV.

Signalling on single track lines.

Preliminary documents.

Report (America (North and South), Burma, China, Egypt, Great Britain and North Ireland, Dominions, Protectorates and Colonies, India, Iran, Iraq, Malay States and Pakistan), by H. W. JACKSON. (See *Bulletin*, May 1950, p. 1047, or separate issue No. 21.)

Report (Austria, Belgium and Colony, Bulgaria, Czechoslovakia, Denmark, Fin-

land, France and Overseas Territories, Greece, Hungary, Italy, Luxemburg, Netherlands and Colonies, Norway, Poland, Portugal and Colonies, Rumania, Spain, Sweden, Switzerland, Syria, Turkey and Yugoslavia), by W. A. VRIELYNCK and P. THOMAS. (See *Bulletin*, July 1950, p. 1487, or separate issue No. 31.)

Special Reporter : W. A. VRIELYNCK. (See *Bulletin*, October 1950, p. 2157.)

DISCUSSION BY THE SECTION.

Meeting of the 2nd October 1950.

PRESIDENT : Mr. W. A. VRIELYNCK.

The President and Special Reporter (in French). — Gentlemen, before we begin to examine Question XV, I want to remind you that at the beginning of the discussions I called your attention to the confusion the Special Reporter and the Reporters of the 5th Section in general found, owing to the fact that the questionnaires were sent not only to the Light and Colonial Railways but also to the Main Line and Secondary Railways.

The secondary railways in fact are indistinguishable from the main line

railways apart perhaps from the extent of their lines. Moreover, their problems are identical with those with which the main line railways are faced.

As regards Questions XIII and XIV, this did not result in any serious drawbacks. We merely had to make a few discriminations. The technical problems arising in connection with the maintenance of the permanent way and Diesel traction, for example, are the same for no matter what railway, whatever its nature and size. In fact, a permanent

way and some method of traction will always be a necessity, whether it be steam or Diesel; the same problems arise.

There is however greater confusion in the case of the question with which we are now going to deal. Signalling is in fact something which can easily be done without. There are many light railways operated in such a way that no signalling is necessary.

Each railway has its own ideas on the subject. Obviously everything will be done to operate a given line with the maximum safety. A few well-defined principles are laid down to insure safety. (*Question IX.*)

From this point of view, we should like to point out that Section III dealt with a question concerning signalling and safety problems.

The Summaries adopted by this Section show that each railway extols its own signalling system. For example, as regards light signals and speed and direction signalling, Summary 1 states :

« 1. The systems of light signalling used by the different railways vary so much and each railway, owing to the amount of signalling already in use, is so committed to its own system that it would not be practicable to adopt a uniform system for all railways even if a common system could be agreed upon. »

This statement applies equally well to the signalling of single track lines, as well as to signalling in general.

Moreover Question XV is really the result of a misunderstanding!

It was put on the agenda on the initiative of the Société Nationale des Chemins de fer Vicinaux (Belgium). But this Com-

pany had in mind solely light railways, and considers itself to some extent to be a light railway. The light railway is in fact the successor of that old winding and twisting tramway of heroic memory with which we became acquainted in 1900, whose greatest development took place between 1900 and the end of the first world war. It was usually made up of a small 15 to 20 t locomotive and a 5 to 10 t trailer, there was no separate permanent way and it only left the roadway when the gradients were too steep for locomotives of this type; the public had free access to all parts of its installations. It is the successors of this famous small local railway, those who replaced steam traction by diesel traction, those which in fact still fulfilled a useful purpose who found themselves faced with the problem of the single track line. Operating conditions necessitated a solution which did not require any specialised labour, requiring the signals to be operated by the train staff, or better still automatic signalling. This was what we really had in mind when we suggested putting this question on the agenda.

But as I informed you just now the questionnaires were sent to all the railways, and each of them reported how they had solved the problem of traffic on their single track lines.

The Summary relating to Question IX adopted by the 3rd Section which I read you just now, brings out very clearly the difficulties lying in the way of standardisation of the different signalling systems now in use.

As a result, we were obliged to treat the question perhaps in a too general fashion, putting forward some rather

academic summaries, which do not deal with the technical aspect seeing that we could not find amongst the details given in the replies received any installations which really answered the ends in view.

Consequently, before opening the discussions, I would like to ask one question : Are there here present any representatives of railways operating a light railway who find themselves faced with the same problem? Have they installed any signalling system on a line completely accessible to the public which works automatically as far as possible? (*No reply.*)

It appears therefore that no one has had to solve the problem in question.

Gentlemen, if no one has any comments to make or general observations to put forward, we will proceed immediately to examine the Summaries.

As these Summaries are fairly brief, I would first of all like to know if you all agree to the classification proposed as regards the different points of view of appreciation of the signalling systems used, namely : 1) Safety obtained; 2) Rapidity of working; 3) Staff employed and 4) Cost in installation, maintenance and operation. (*Agreed.*)

I will now read you Summary 1.

Summary No. 1.

1. Lines of small importance carrying a light regular traffic can very well dispense with any special single line signalling, the crossing of trains taking place at definite points laid down in advance and which must be adhered to.

Any comments?

Mr. Jackson, Reporter. — I recommend that the word « regular » be omitted.

— I do not think the word « regular » should be included on lines of small importance carrying a light traffic.

Mr. Van Lierde, Principal Secretary (in French). — I agree with Mr. JACKSON.

The President. — When the normal traffic is regular, crossings can take place at predetermined points. Running an extra train is an altogether special matter.

Mr. Van Lierde. — But it can arise.

The President. — Yes, but in this case, there are other conditions to be observed; a preliminary announcement must be made. We are not mentioning exceptional cases here. They might be mentioned later.

In this Summary, I merely wanted to insist upon the fact that we have lines with regular and normal traffic where the trains run at given hours and that this traffic necessitates crossings at certain predetermined points, crossings at which the two guards can sign their route sheets.

This applies solely in the case of traffic based on a timetable showing train crossing at certain well defined* points.

I do not understand why Mr. JACKSON does not agree to the word « regular ».

Mr. Jackson. — Well Mr. PRESIDENT, I have yet to see a railway where the traffic is regular. There may be a regular timetable laid down for scheduling the trains but it is seldom that this timetable is adhered to. Either the train starts late or it meets with some obstruction in the section somewhere. In each case it is

then running out of course entirely, with the result that many arrangements made by the timetable have to be altered and special arrangements have to be adopted to enable the train to complete its journey.

The President. — I quite agree with « special arrangements ».

Mr. Van Lierde (*speaking to Mr. JACKSON*). — Have you a timetable for your passenger trains?

Mr. Jackson. — We have a theoretical timetable, particularly for goods trains, but the trains run irregularly due to various causes and it has actually been suggested that that schedule timetable be abolished.

The President. — The trains leave at a certain time. This is the general idea. I say : when the lines are not very important and carry a small regular traffic one can very well do without any special signalling. Do you agree with this?

Mr. Jackson. — I agree with that, but I go further. I say that if it is a light traffic not necessarily regular, you may dispense with the signal.

Colonel Wilson, *Ministry of Transport (Great Britain)*. — May I suggest that the necessity for a timetable depends almost entirely on the lightness of the traffic. If the traffic is very light indeed then a timetable might well be dispensed with. Different railway systems, however, might put different interpretations on the word « light », and even here we may not all be talking about the same thing. I think therefore, that we need to be more pre-

cise; otherwise we may get into difficulties.

The President. — Fundamentally, there is no great drawback in suppressing the words « and regular ». It is in fact an extension of Summary No. 1.

Mr. Van Lierde. — I suggest saying : « Lines of small importance with little goods traffic and regular passenger services... ».

Mr. De Backer, *Ministère des Colonies (Belgique)* (in French). — In the Colonies, the regular goods trains are included in the service tables.

Mr. Van Lierde. — These services *may* be regular, but the passenger services *must* be regular.

The President. — I do not agree with Mr. JACKSON's suggestion. My idea is that the traffic must be regular, otherwise I do not think it is possible to fix the points at which the train crossings must take place.

Mr. Jackson. — Well Mr. PRESIDENT, we do not work by timetable.

Mr. Ripert, *Société Générale des Chemins de fer Economiques (France)* (in French). — The telephone can be used.

The President. — We are not considering the use of the telephone here. I know that many companies do use the telephone. But in this case I am starting from the hypothesis that there is absolutely nothing. And where there is nothing, the crossings must be fixed.

I do not agree with Mr. VAN LIERDE's suggestion. I consider that the traffic must be regular or based on a timetable, otherwise it is impossible to fix any crossing points. I have a regular service; I impose it even on the goods traffic. You are going on the passenger service timetables and supposing that train crossings take place at no matter what hour and in no matter what direction, but keeping to the times of the regular goods traffic.

Mr. Van Lierde. — No, I only impose a single rule : The goods services without a definite timetable will cross at any point, in any direction and at not matter what time, but — and this is the essential point — they must be at the crossing place at least a few minutes before the arrival of the regular train shown on the timetable. This is the rule, I do not say it is a good one, but it is a simple one : there must be a certain number of minutes in hand before the normal passenger train service.

The President. — In the other direction?

Mr. Van Lierde. — Or in the same direction.

The President. — It must therefore be alone in the section, without being covered?

Mr. Van Lierde. — No, it must be shunted to leave the line clear.

Mr. Thomas, Reporter (in French). — As Mr. JACKSON has pointed out the

question of the timetables means absolutely nothing, since they are not adhered to. There is always some irregularity or other on the lines which means that it is impossible to adhere to the timetable.

The President. — Gentlemen, these discussions seem to me to be getting very confused.

If you have a train which is not running to the timetable, what do you do?

Mr. De Backer. — We do not work to timetables.

Mr. Jackson. — So far as I know, there is only one railway in the world which works by timetables and those are the American Railways.

The President. — I do not agree.

Mr. Jackson. — In America, the timetable takes on an importance which it does not do in other countries. In South Africa and other countries with which I have been in contact, the timetable is a guide to the running of the traffic. The times shewn are those times before which the trains will not leave, not the times at which they will leave, but the timetable is not the authority for the despatch of the train. It is solely the scheduled journey of a particular train and how it is affected by the scheduled journey of other trains.

The authority for the train to proceed is not the timetable, except on certain lines, but the authority to proceed may be a telephone message, a written message, a telegraph message or a token, or a signal.

The President. — I note therefore that the timetable is not the authority except in the United States and certain other countries. I understand from what Mr. JACKSON has just said that the authority is actually a telephone or written message, etc.

But what is done on those lines where there is no token, telephone or other mechanical means of signalling?

In Belgium, for example, we have several lines without a telephone or token signalling system. Crossings take place at certain times if possible between trains Nos. 1 and 2. Obviously, this time cannot always be adhered to; it is only an indication.

Mr. Jackson. — In view of your explanation, I am prepared to withdraw the word « regular ». I must confess I have never met a railway like that.

Mr. Thomas. — I suggest saying : « reduced traffic based on a timetable ».

Mr. Van Lierde. — That does not meet the point.

The President. — The expression « based on a timetable » is not a synonym for « fixed crossing place ».

Mr. Thomas. — The timetable must be considered a means to an end.

The President. — Is the majority of the Meeting in favour of suppressing the word « regular »? Or does it wish to retain this expression?

Mr. De Backer. — We might get round the difficulty by saying that only lines with regular traffic can do without signalling.

Mr. Jackson. — I agree. May I suggest that there be a clause put in the Summary to make it perfectly clear that this applies where there are no means of communication.

The President. — Certainly.

Mr. Jackson. — That may not be understood by everyone. I would not class a telephone or telegraph as a method of signalling, and I think there are others who may think the same as I do.

The President. — There is some confusion in Mr. JACKSON's mind. Our colleague does not think that such crossings take place without an exchange of tokens. It is simply a question of making sure that the service works without any mechanical means of recognition, for example stipulating that train No. 1 crosses train No. 2 at such and such a place. That is all. We say « signalling ». The transmission of orders by pilot sticks, tokens, telephone, etc. should rather be qualified as « signalling arrangements ».

Mr. Van Lierde. — Or « methods of transmitting orders ».

Mr. Thomas. — Could we not say : « on lines of little importance, with little regular traffic, crossings can well take place at predetermined points, without any other arrangement »?

Mr. Jackson. — It is so entirely foreign to our way of working that it requires a little bit of re-orientation. I suppose it would possibly be all right in certain cases but I am afraid the majority of the railways which I represent here would not agree to it.

The President. — We might say not that the crossings take place at predetermined points but according to predetermined conditions. We might retain the words «at predetermined points» and add at the end «or according to predetermined conditions».

Mr. Thomas. — Crossings do not therefore take place at well defined points? But, if I understand it aright, the trains have to respect certain regulations? I would like to know how such regulations can be defined?

The President. — On the basis of a clearly defined timetable for train No. 1, train No. 2 gets the order to pass train No. 1 at a given point on its run, but has to be at the crossing point a minimum number of minutes before the arrival of the first train. Train No. 1 has priority to pass and train No. 2 must respect the timetable of train No. 1 and the agreed crossing. The only formal obligation which it has to fulfil during its run is to be at such and such a crossing place so many minutes before train No. 1 passes.

Mr. Van Lierde. — At that moment, it is an exceptional train. Now there may be several of them. All the goods trains may be exceptional trains.

The President. — We cannot draft summaries to cover exceptional cases, it would be too difficult to find a suitable text.

Gentlemen, I think it is useless to prolong these discussions. We are simply discussing words. I would prefer the summary to remain as it is, naturally if the majority are in agreement.

However in view of Mr. JACKSON'S objection to the word «regular» I think we might suppress the words «well defined» and say «... at points laid down by pre-established regulations». (*Agreed.*)

Consequently the text of Summary No. 1 will read as follows :

«1. Lines of small importance carrying a light regular traffic can very well dispense with single line signalling. Crossings of trains taking place at definite points laid down in advance, or according to pre-established regulations.»

Does the Meeting agree? (*Agreed.*)

— *Summary No. 1 amended in this way was adopted.*

The President. — We now come to *Summary No. 2* which reads :

2. Lines lending themselves to be worked with a shuttle service use the ordinary plain train-staff.

Does the Meeting agree?

— *Summary No. 2 was adopted without comment.*

The President. — This brings us to *Summary No. 3* which is worded as follows :

3. The lines carrying a more important and relatively irregular traffic, passing through

districts where the cost of labour is low and technically competent persons rarely met with (as in the Colonies) have usefully had recourse to the Webb & Thompson electric train-staff, which affords all the safety that can be desired. It is moreover of simple design and robust construction.

Mr. Jackson. — In the first place, I do not think it wise to put in any reference to the cost of labour or technically competent staff met with, as in the Colonies, because it is difficult to define what are Colonies. There are Colonies and Colonies, Dominions and Dominions.

Furthermore, I have objection to the mention of the Webb & Thompson train-staff. There are several token instruments which are quite reliable; there is the Webb & Thompson staff instrument, that is a big one, and there is the ordinary tablet instrument, and I feel that the conclusion should read somewhat on these lines :

« The lines regularly carrying more important and relatively irregular traffic should be equipped with a form of token instrument control which has been found satisfactory. »

Colonel Wilson. — I would like to support Mr. JACKSON very strongly in that amendment. The electric token instruments have served admirably for working single lines in Great Britain, where I think it could hardly be suggested that the cost of labour is low; nor, I hope, that there are no technically competent persons to work them. As Mr. JACKSON said, there are many forms of token instrument which do exactly the same thing as the Webb & Thompson. I should like to substitute the words « electric token » for « token » in Mr. JACKSON's statement.

The President. — This text seems to me impossible in this form, as it excludes ipso facto every other method. I consider that this system is very suitable provided there are employees at fixed posts. I agree that the electric locking type of this method gives the necessary safety, much better than the telephone system for example, where the human factor comes in. It is nonetheless true that it must be possible to count upon a well trained staff, as an error of interpretation, even when a specialized staff is available, is always possible.

In this connection, I would like to know if the systems mentioned by Colonel WILSON gave the same degree of safety as the Webb & Thompson system?

Colonel Wilson. — Undoubtedly. Other token systems give just the same results as the Webb & Thompson. Although their electrical design is rather different and they have different forms of token.

The President. — I only mentioned the Webb & Thompson system to serve as a guide in making a comparison.

Colonel Wilson. — The Webb & Thompson is rather falling into dis-use. We are now in favour of the small token systems.

Mr. Van Lierde. — It seems to me that the Summary might be left as it is if the words « Webb & Thompson » were suppressed.

The President. — Colonel WILSON points out that there are other electric systems in England.

If this system is still used in England, is it not chiefly to use the staff responsible for the signalling for other jobs?

Colonel Wilson. — It is the signalman who works it.

The President. — Is the signalman responsible only for this job?

Colonel Wilson. — He works the signal levers as well.

The President. — The stationmaster can do it, or anyone detailed by him for this job.

Mr. Van Lierde. — When we speak of light railways, there is no question of freeing the staff since the great majority of our stations have no staff. We might word the Summary as follows: « On lines where staff is available... »

The President. — I do not quite see why.

Like me you will know of light railways which have no staff available along the line. It seems to me it is not possible to visualize such a method being used on such lines as these.

Mr. Richelot, *Office des Transports Coloniaux (OTRACO), Belgique* (in French). — I suppose if the importance of the traffic necessitated a telephone operator, it would cost too much.

The President. — How much does the Webb & Thompson cost compared with telephone lines.

Mr. Jackson. — I could not give you here the correct amount.

The President. — Where there is a telephone installation, obviously we do not imagine it will be suppressed. Signalling by telephone has its uses; but we do not think it is essential to use telephone lines.

Mr. Richelot. — In the colonies, it is impossible to conceive of working without telephone lines.

The President. — Obviously, when such installations exist, it is only natural to make use of them.

Mr. Van Lierde. — Could we not say in the Summary: « Lines where qualified staff are available at crossing points... »?

Mr. Masseron, *Compagnie Fermière des Chemins de fer Tunisiens* (in French). — We should in fact include in the Summary « Lines where staff are available at crossing points ».

The President. — I simply wished to insist of the fact that the telephone system, in my opinion, does not give the necessary security whereas the electric interlocking system, the token and electric train staff system give all the safety necessary.

Colonel Wilson. — We consider in England that single line working with our token instruments is safer than any form of block working on double system.

The President. — But not with the automatic block system?

Colonel Wilson. — I do not agree that automatic block system is safer than any form of token system.

Mr. Jackson. — With the automatic system the authority to go is a signal. That may be ignored by the driver. It may be irregularly operated — not often — but it may be. With the token system you have the two operators, the one at that station, and the one at this station co-operating, and this means, whoever withdraws the token works with the driver. It is a perfectly safe form of control.

Colonel Wilson. — I would like to keep these words — « which gives safety as good, or better, than the automatic block system ».

The President. — I would like to point out that when there is a suitable and clear arrangement, no error of interpretation of the automatic signal is possible. The signal is red or green. If it is red, it means stop. If it is green, it means go:

Mr. Van Lierde. — Could we not say instead of « gives all the necessary safety » « this system gives the same degree of safety as the block system »?

The President. — That is a possible formula, but I would like to point out that the British Delegates think their system is better.

Mr. Van Lierde. — Could we not state : « at least as great as that of the block system »? This is obviously important seeing that token signalling costs much less than the block system.

Mr. Richelot. — We must still include the idea that « staff must be available at the crossing points ».

Mr. Jackson. — Why make a comparison with the block system? Why not just treat the token system on its own merits and simply say « which affords all the safety that can be desired »?

The President. — Gentlemen, it seems to me that this very thorough discussion gives a sufficiently clear indication of the tendency which the Meeting wishes to see set down in the text. The following wording might in my opinion satisfy everyone :

« 3. Lines carrying a more important and relatively irregular traffic, in administrations where personnel are stationed at the crossing points, have usefully had recourse to electric token instruments. This system gives the degree of safety required. It is moreover of simple design and robust construction. »

— Does the Meeting agree? This text takes all the comments made into account.

— *Summary No. 3 modified in this way was adopted.*

The President. — We now come to *Summary No. 4* :

4. Lines where there is considerable traffic and overall speed is high tend to adopt automatic signalling. When a line is laid on its own inaccessible right of way, track circuits are used. If it is laid alongside or in the roadway itself, i.e. if it has the character of a tramway line, it becomes necessary to use special circuits and overhead contact makers, or « trolley contactors ». It is in any case useful to arrange for repeating lights, as this increases the safety of operation.

It appears that amongst the railway systems whose opinion has been asked, there are very few that are of this kind. This

explains why the Belgian National Light Railways Company is apparently the only one using this system of signalling.

Are any representatives of railways using this system present? (*No.*)

I am very sorry as I should have liked to discuss the advantages of their installations with them. Unfortunately, I have never had any experience of such a system. I must inform you that for many years we have carried out studies. We have made attempts to record trains automatically when they ran into a section and only free the latter when the same number of trains had left the section. But this gives rise to a clocking system which goes wrong very easily. And so we had to give it up.

As regards the use of repeating lights, do any other railways use these? Are there any railways using the automatic block system? Naturally, I mean in connection with single track lines.

We considered that these repeating lights were extremely useful although they are not essential in principle, as if you use a red light, there is no point in having repeating lights. This answers Mr. JACKSON's comment.

As an example, I would like to say that we install 7 repeating lights on a 2 km (2 190 yards) section; these lights are in series.

For example, if anything goes wrong, the train driver sees it at once. If the repeating light is out or reserved, the attention of the staff is immediately called to any danger to the train.

Repeating lights are undoubtedly a great safety measure.

Mr. Jackson. — I think it is too special. It is a special form of arrangement. I agree to some extent to the first portion « Lines where there is considerable traffic and overall speed is high tend to adopt automatic signalling. » Automatic signalling or semi-automatic block form of signalling is to a great extent in use in Switzerland.

Mr. Thomas. — When you say « automatic » does it mean that the responsibility is clearly defined? What does « semi-automatic » mean?

Mr. Jackson. — It is necessary to make a distinction. « Automatic block » means that the block is made automatically; to free the block, something has to be done, by a member of the staff.

The President. — I suppose Mr. JACKSON does not like the wording of the sentence : « When a line is laid on its own inaccessible right of way, track circuits are used ».

Mr. Jackson. — I have no objection to the wording. Mr. PRESIDENT, I feel that there may be an objection to my use of the word « semi-automatic », but automatic signalling alone is insufficient. There are other forms of signalling such as in use on the Swiss Railways, but they are probably used on other railways as well.

I cannot think of any other expression than « semi-automatic » to cover this method, if you agree about this.

The President. — Once more, we are taking it that no specially appointed staff

is being used. Under these conditions, there are no objections to adding « or semi-automatic ». (*Agreed.*)

Mr. Jackson. — I suggest suppressing the last paragraph, which is special to Belgium.

The President. — Personally, I see no disadvantage in so doing. Does the Meeting agree? (*Agreed.*)

Consequently the final text of Summary 4 will read as follows :

« 4. Lines, where there is considerable traffic and overall speed is high, tend to adopt automatic or semi-automatic signalling. When a line is laid on its own inaccessible right of way, track circuits are used. If it is laid alongside or in the roadway itself, i. e. if it has the character of a tramway line, it becomes necessary to use special circuits and overhead contact makers, or « trolley contactors ». It is in any case useful to arrange for repeating lights, as this increases the safety of operation. »

I will put this text to the vote.

— *Summary No. 4 modified in this way was adopted.*

The President. — We now come to *Summary No. 5* :

5. All lines are agreed in not permitting, under normal conditions, more than one train at a time to be in a single line section and in prohibiting setting back in the section.

Mr. Jackson. — I am afraid that I must disagree with that suggestion.

The President. — Under normal conditions?

Mr. Jackson. — No, Mr. President. The Victorian State Railways and the South African Railways adopt what is known as « permissive » working, that is, trains following in the same section, as a normal method. Therefore, may I suggest that the clause be amended as follows :

« a) The majority of railways do not permit under normal conditions more than one train to be in a single line section.

« b) All railways prohibit setting back of trains in certain sections. »

The President. — I suppose there is unanimity as regards the prohibition of setting back? (*Agreed.*)

Mr. Masseron. — In principle, in Tunisia we all set back in the case of service trains and trolleys, and such settings back frequently occur.

Consequently, in order to avoid any ambiguity, I think the Summary should be worded as follows : « ... forbid setting back in the case of the regular traffic. »

The President. — I would like to point that we are not concerned with special cases in the Summaries. And service trains are special cases.

Mr. Masseron. — That is precisely why we should say « under normal conditions » or « for the normal regular traffic ».

The President. — Does the Meeting agree to the following text which takes into account the observations made during the discussions :

« a) The majority of railways are

agreed in not permitting, under normal conditions, more than one train at a time on a single line section;

« *b*) All Administrations are agreed that setting back should be forbidden as far as ordinary trains are concerned. » (*Agreed*).

— *Summary No. 5 was adopted in this modified form.*

The President. — We now come to *Summary No. 6* :

6. On those lines where the traffic is regulated by telephone, the signals used appear to be those controlling the stations themselves rather than the actual single line. In consequence they are outside the scope of the matter under discussion in this statement.

Mr. Ripert. — This more generally occurs on light railways. On lines with very little traffic, no signalling is provided. On lines with heavy traffic, the signalling methods which we have just examined are used. In intermediate cases, which are the most usual in France, the working is done on request for « line clear » by telephone. There are no other signals than those protecting the stations. In my opinion, it is essential to stress the fact that in France this latter case is the most usual.

Mr. Protat, *Chemins de fer de l'Indo-chine* (in French). — Could we not say « by telephone or by telegraph »? Very often this latter method is preferred because a copy of the order is available.

The President. — Are orders in connection with the working given by telephone?

Mr. Ripert. — Yes. But in our opinion the telephone offers sufficient security.

The President. — Can you interfere and modify the running of the trains?

Mr. Ripert. — Yes, the telephone gives very great flexibility. Moreover, where the telephone exists, it is retained.

The President. — That is only logical.

Mr. Ripert. — We have up to 24 trains a day on a line running at a speed of 70 km (43 miles)/h.

The President. — And is safety assured?

Mr. Ripert. — We have already had sufficient experience to know that the safety is sufficiently assured.

The President. — We will take a vote. Does the Meeting agree to a Summary worded as follows which takes the remarks made into account :

« 6. On those lines where the traffic is regulated by telephone or telegraph, the signals used appear to be those controlling the stations themselves rather than the actual single line. In consequence they are outside the scope of the matter under discussion in this statement. »

— *Summary No. 6 was put to the vote and adopted in this modified form.*

The President. — *Summary No. 7* :

7. Telephone working under the control of staff located at fixed points along the line (traffic controllers or regulators, station-

masters) allows of dealing easily and quickly with any unexpected situation that may arise. It is conceivable that it will continue to be used where it is necessary to employ stationmasters on account of there being a considerable goods traffic to be dealt with.

I suppose it is clear that the stationmaster on the light railways has nothing else to do but assure the goods traffic. If there is no goods traffic, you probably do not have any stationmasters?

Mr. Van Lierde. — In my opinion, the different conditions on different railways must be taken into account. In France, for example, the distances between the stations are probably very considerable. In Belgium, the distances between the stations usually vary between 2 and 3 km (2 190 to 3 280 yards).

Mr. Ripert. — On our lines, the average is about 10 km (10 940 yards).

Mr. Van Lierde. — The question is altogether different therefore. With our density of population, the distance between stations cannot be more than 2 or 3 km.

The President. — The multiplication of stationmasters must surely involve increasing delays?

Mr. Van Lierde. — So do not suggest putting stationmasters at crossings.

Mr. Ripert. — We have stationmasters in the stations where there are a large number of passengers, even if there is no goods traffic.

The President. — What do you mean by a « large number of passengers? How many passengers at a time does this mean?

Mr. Ripert. — A train may take 800 passengers as a maximum figure.

The President. — Cannot the station staff be used for other jobs if necessary?

A Delegate. — The traffic may be seasonal. Such employees cannot be used for signalling.

We might say in the Summary : « It is conceivable that telephone or telegraph control will be retained where it is necessary to employ stationmasters. » (*Agreed.*)

The President. — The final text will therefore read :

« 7. Telephone and telegraph working under the control of staff located at fixed points along the line (traffic controllers or regulators, stationmasters) allows of dealing easily and quickly with any unexpected situation that may arise. It is conceivable that it will continue to be used where it is necessary to employ stationmasters. »

Does the Meeting agree to this text ? (*Agreed.*)

— *Summary No. 7 was adopted in this amended form.*

The President. — To end our study of Question XV I have added a *Note*. The text reads :

Note.

No railway to our knowledge is making use of radio-telephony. This implies control over the train running by a traffic controller or dispatcher constantly in communication with the guards of the various trains, to whom he would have to give instructions and of which they would be able to acknowledge receipt. This system would cost but little to install and to maintain, and it would be able to be worked quickly and allow of dealing

easily with any unexpected conditions. From the safety point of view, however, it would evidently offer all the disadvantages of systems liable to give rise to mistakes when transmitting messages, a defect inherent in all telephonic communications.

I should be very glad if those delegates whose railways make use of radio-telephony would give us a few details about it. I believe in practice this system is not yet in regular use. But perhaps trials are being carried out on some railways?

Mr. Harter, *Chemins de fer de l'Indochine* (in French). — In Indochina, for the last three years, we have been authorised to make use of the radio. In fact, radio is taking the place of the ordinary telegraph services, which have been destroyed and sabotaged by the rebels.

We have set up radio stations in the chief stations and in the trains and we can communicate both with the stations and with the trains to which orders are given when they stop, even when this is between two stations.

We have not been able to equip all our stations with radio. We have set up these installations wherever there is a military guard. We cannot go on multiplying them indefinitely; they are 30 to 40 km (18 to 25 miles) apart.

I might add that on lines where the rebels give a great deal of trouble, we have been obliged to operate « in convoy ». Six to seven trains run one closely following the other protected by a strong military escort. This exceptional situation alters the operating problems entirely. The radio in fact is taking the place of the telegraph services. The two systems are not being used side by side.

In practice, the use of radio has proved satisfactory and we use it whenever possible. It is now being used more widely than the telegraph services. The difficult position on the roads favours its development at the expense of the latter.

Certain installations are on the actual trains. The operator repeats the instructions he receives. When the trains are being run in convoys, the orders are sent to 5 or 6 trains, which are all equipped with radio-telephony.

The President. — You have just said that this method of signalling is satisfactory. Are you proposing to retain the system?

Mr. Harter. — The system will very probably be retained. I do not think we shall return to the telegraph system.

Mr. Masseron. — I would like to point out that tests have also been made on the Mediterranean-Niger Railway. According to the information received, the system has proved satisfactory. Radio posts are installed on passenger trains only. A centre station gives the necessary instructions to the passenger trains, according to the way the goods trains are running.

Mr. Harter. — We give orders to distances of up to 200 km (124 miles).

The President. — This is very interesting. Does the guard also have to repeat the instructions received, as in Indochina?

It seems to me in fact that safety is greater with the radiotelephony system

than with the telephone or telegraph system, because the guard himself repeats the orders received.

It would be interesting to continue these investigations and trials.

Mr. Masseron. — This might be included in the suggested text.

Mr. Richelot. — It might be stated in fact that in Indochina and on the Mediterranean-Niger Railway radio-telephony has been used for communications between the control staff and train guards.

The President. — The method appears to have proved completely satisfactory therefore up to now. All the same, it should be pointed out that it is in its infancy and further improvements are possible.

Mr. Thomas. — Should it also be stated that in view of what we have just heard, the future of this method seems assured?

The President. — In principle, it gives a greater measure of security than the ordinary telephone system.

Mr. Thomas. — On what wave-lengths do you work?

Mr. Harter. — The wave-lengths in question are those of the military services which vary quite a lot; generally, they are about 40 m (131').

Mr. Protat. — We also have some very short waves : 2 to 3 m (6'6" to 9' 10").

Mr. Ripert. — We have made similar trials in France. We experienced some difficulties, and obtained results varying considerably. For example, it was found that certain stations could not pick up the messages, whilst others much further away from the emitting station were able to do so.

The President. — What about the working costs?

Mr. Richelot. — Generally, up to now, the equipment has cost very little. It is American stock.

The President. — Are these methods used in South Africa?

Mr. Jackson. — No, but similar methods are used in the U. S. A. not only as a means of communication, but for operating purposes. So far as South Africa is concerned, we are not using it at all.

Mr. Richelot. — For the Congo, the method offers great advantages. We are thinking of developing it as much as possible. We are considering equipping not only the large stations, but also the lines themselves.

The President. — In fact, you are going to do away with the telephone.

Mr. Richelot. — We use this method to facilitate operations in the yards and harbours. There is a central station in communication with the different shunting engines.

The President. — Over what distances?

Mr. Richelot. — Some fifteen km (9 miles).

The President. — So that, at least in principle, your lines in the Congo are equipped with the telephone, but side by side with this you are installing the new radio-telephony system?

Mr. Richelot. — That is correct.

The President. — Does not this lead to unduly high maintenance costs?

Mr. Richelot. — No, as a rule labour is cheap in the colonies.

Mr. Harter. — In Indochina, in spite of the fact that staff to maintain the lines does not cost much, the radio-telephony system costs still less.

Mr. Thomas. — Was it stated just now that certain difficulties were experienced on account of the wave-lengths?

Mr. Richelot. — Yes, the problem of the wave-lengths does come into the picture.

From the experience obtained in our various installations, it results that for short distance communications, as in the case of centralised control of the shunting in the stations, no objections are made by the Telecommunication Departments. However, it is not the same as far as communications over long distances are concerned (hundreds and thousands of kilometres). The Government Departments tend to reserve for themselves the appropriate wave-lengths and require private firms, even transport

organizations, to act through the intermediary of the State emitting stations. It is the case for our river traffic in the Congo.

Mr. Protat. — In Indochina, we also have experienced difficulties. The Authorities first of all gave us four wave-lengths, but afterwards they went back on this decision. We were only able to retain the system by paying a special royalty; in fact, we enjoy a special regime.

Mr. Ripert. — These difficulties are not insurmountable. In Paris, we have a central transmitting station in communication with all the breakdown vans in Paris and the suburbs, able to transmit messages up to 40 km (25 miles). The system is therefore satisfactory in the case of accidents. There are moreover other applications of radiotelephony, for example in the police and fire services.

Colonel Wilson. — British Railways are very chary of using it for any purpose of safety, but they have used it for communication for control of breakdown gangs. It is used in America, and to a certain extent in England, for the control of operations in marshalling yards, between the control point and the shunting engines and the shunting staff. We should, however, be very reluctant indeed to adopt it for train movements from the point of safety.

The President. — Do you not think that this system is better than telephone communication? It is not so safe as token control but better than all telephone systems.

Colonel Wilson. — No.

The President. — Are you communicating with the drivers of the trains?

Colonel Wilson. — I think there are very many possibilities of misunderstanding by train crews.

The President. — If the conditions are fixed, it seems to me that the difficulties of interpretation which you are afraid of are rendered out of the question. There is no danger when the operator repeats the message, he has just received. This fact makes this method just as safe as other methods.

Colonel Wilson. — I would rather prefer the word « safety » out of this altogether.

Mr. Jackson. — This method gives greater facilities.

The President. — It seems to me that there is agreement that any reference to « safety » should be omitted from the proposed text. I suggest therefore that the Meeting should adopt the following additional Summary :

« Certain systems have made use of

radio-telephonic communication between control personnel and train guards. This system, which is still in the experimental stage, has given complete satisfaction and would definitely appear to have future possibilities. »

I think that this text takes into account all the comments made and will please everyone. (*Agreed.*)

— *This additional Summary was adopted as No. 8.*

The President. — Gentlemen, this brings us to the end of our agenda. I think that Section V has brought its labours to a fruitful end, thanks to your good will and kind cooperation. Personally, I wish to thank you all very sincerely.

The Summaries which we have just voted will I am sure be ratified by the Plenary Meeting.

I wish to all of you and your families a very enjoyable stay in Italy and hope to see you all again at the next Session, when we will be able to put forward our ideas and study some new problems.

I also wish you all a happy return to your own countries after your sojourn here. (*Applause.*)

— The Meeting ended at 11. 15 a.m.

DISCUSSION AT THE PLENARY MEETING.

Meeting held on October 4th, 1950.

DR. ENG. G. DI RAIMONDO, PRESIDENT, IN THE CHAIR.

GENERAL SECRETARIES : MR. P. GHILAIN AND DR. ENG. M. VALDIVIESO.

ASSISTANT GENERAL SECRETARY : MR. CH. E. WHITWORTH.

Mr. Ghilain, General Secretary (in French). — We will now examine the Summaries relating to Question XV, appearing in the *Daily Journal of the Congress*, No. 6 dated 3rd October 1950.

(No objections were raised during the examination of these Summaries.)

The President (in French). — We may therefore consider the Summaries for Question XV as ratified.

SUMMARIES.

« 1. Lines of small importance carrying a light regular traffic can very well dispense with single line signalling. Crossings of trains taking place at definite points laid down in advance, or according to pre-established regulations.

« 2. Lines lending themselves to be worked with a shuttle service use the ordinary plain train-staff.

« 3. Lines carrying a more important and relatively irregular traffic, in administrations where personnel are stationed at the crossing points, have usefully had recourse to electric token instruments. This system gives the degree of safety required. It is more-

« over of simple design and robust construction.

« 4. Lines, where there is considerable traffic and overall speed is high, tend to adopt automatic or semi-automatic signalling. When a line is laid on its own inaccessible right of way, track circuits are used. If it is laid alongside or in the roadway itself, i. e. if it has the character of a tramway line, it becomes necessary to use special circuits and overhead contact makers, or « trolley contactors ». It is in any case useful to arrange for repeating lights, as this increases the safety of operation.

« 5. a) The majority of railways are agreed in not permitting, under normal conditions, more than one train at a time on a single line section;

« b) All Administrations are agreed that setting back should be forbidden as far as ordinary trains are concerned.

« 6. On those lines where the traffic is regulated by telephone or telegraph, the signals used appear to be those controlling the stations themselves rather than the actual single line. In consequence, they are outside the

« scope of the matter under discussion
« in this statement.

« 7. Telephone and telegraph work-
« ing under the control of staff located
« at fixed points along the line (traffic
« controllers or regulators, stationmas-
« ters) allows of dealing easily and
« quickly with any unexpected situation
« that may arise. It is conceivable that

« it will continue to be used where it is
« necessary to employ stationmasters.

« 8. Certain systems have made use
« of radio-telephonic communication
« between control personnel and train
« guards. This system which is still in
« the experimental stage has given com-
« plete satisfaction and would definitely
« appear to have future possibilities. »

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(DECEMBER 1951)

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MAURER (A.). — La soudure des joints de rails. (1 500 mots & fig.)

In German.

Elektrische Bahnen. (München.)

- 1951** 621 .135 .4 & 625 .21
Elektrische Bahnen, Mai, S. 109; Juni, S. 133.
HEUMANN (H.). — Grundzüge der Führung der Schienenfahrzeuge. (15 000 Wörter & Abb.)
- — — — — 621 .335 (44)
1951
Elektrische Bahnen, Mai, S. 125; Juni, S. 144.
MANZ (G.). — Prüfmethode und Entwicklungstendenzen bei den Hauptumspannern der elektrischen 16 2/3 Hz Lokomotiven der Deutschen Bundesbahn. (9 000 Wörter & Abb.)
- — — — — 621 .336 (44)
1951
Elektrische Bahnen, Juni, S. 150.
HUG (Ad.-M.). — Neue Fahrdrahtschmiervorrichtungen bei italienischen Eisenbahnen. (500 Wörter & Abb.)
- — — — — 621 .33
1951
Elektrische Bahnen, Juni, S. 151.
NIBLER (H.). — Neuerungen im Fahrleitungsbau. (800 Wörter & Abb.)
- — — — — 621 .33
1951
Elektrische Bahnen, Juli, S. 159; August, S. 189.
KOTHE (H.). — Zur Wahl von Bahnstromsystemen. (20 000 Wörter & Abb.)
- — — — — 621 .33
1951
Elektrische Bahnen, Juli, S. 175.
SCHRÖTER (F.). — Querstrommessungen an Kohlbürsten bei ruhendem Stromwender. (2 000 Wörter & Abb.)

Glaser's Annalen. (Berlin.)

1951 625 .2
Glaser's Annalen, April, S. 76.
PREUSS (M.). — **Wirtschaftlichkeit des Leichtmetall-
baues im Verkehrswesen.** (2 000 Wörter & Abb.)

1951 625 .28 (47)
Glaser's Annalen, April, S. 78.
HÜRLIMANN (W.). — Von den **Triebfahrzeugen** der
russischen Eisenbahnen. (5 000 Wörter & Abb.)

1951 621 .392 & 625 .2
Glaser's Annalen, April, S. 83.
RUPPIN (K.). — **Elektrische Hochleistungs-Punkt-
schweissung im Leichtmetall-Fahrzeugbau.** (1 500 Wörter
& Abb.)

1951 621 .131 .2
Glaser's Annalen, Mai, S. 95.
Dr. Ing. MEINEKE. — **Über wirtschaftliche Bauarten
der Lokomotiv- Dampfmaschine.** (3 000 Wörter & Abb.)

1951 621 .133 .3
Glaser's Annalen, Mai, S. 98; Juni, S. 120.
POSTUPALSKY (N.). — Vereinfachte **Berechnung
des Lokomotivüberhitzers.** (6 000 Wörter, Tabellen &
Abb.)

1951 625 .23 (42 + 436)
Glaser's Annalen, Mai, S. 103.
HILLER (H. W.). — **Doppeldeckwagen** in Österreich
und England. (1 000 Wörter & Abb.)

1951 625 .142 .2
Glaser's Annalen, Mai, S. 104.
DIEHL. — **Lebensdauer von getränkten und unge-
tränkten Holzschwellen** nach bayerischen Erfahrungen.
(2 000 Wörter & Abb.)

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und Verkehrspolitik. (Zürich.)

1951 385 .1 (4)
Schweizerisches Archiv für Verkehrswissenschaft und
Verkehrspolitik, N^o 1, S. 1.
WANNER (F.). — **Lagebericht der europäischen
Eisenbahnen.** (5 000 Wörter.)

1951 385 .15 (494)
Schweizerisches Archiv für Verkehrswissenschaft und
Verkehrspolitik, N^o 1, S. 14.
IKLÉ (M.). — Die finanziellen Aspekte der **Über-
nahme weiterer Privatbahnen** durch den Bund. (10 000
Wörter & Tabellen.)

1951 385 (06)
Schweizerisches Archiv für Verkehrswissenschaft und
Verkehrspolitik, N^o 1, S. 39.
DREYER (G.). — **Les organisations ferroviaires inter-
nationales.** (10 000 mots & tableaux.)

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Ingenieure. (Frankfurt-Main.)

1951 625 .14 & 625 .172
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Mai,
S. 50.

SCHMITZ (H.). — **Gleisabnahme und Gleismessdrai-
sine.** (2 000 Wörter & Abb.)

1951 625 .143 .5
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Mai,
S. 56.

CREMERIUS (W.). — **Schienenbefestigung auf Stahl-
betonschwellen.** (1 500 Wörter & Abb.)

1951 621 .32
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Mai,
S. 58.

HINTERWÄLDER (K.). — **Die Projektierung von
Beleuchtungsanlagen mit Leuchtstofflampen.** (2 000
Wörter & Abb.)

1951 621 .139 & 625 .27
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Mai,
S. 61.

BECKER. — **Wie kann der Stoffverbrauch bei der
Fahrzeugunterhaltung im BW wirtschaftlich gestaltet
werden?** (1 200 Wörter & Tabellen.)

1951 624 .32 (43)
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Juni,
S. 67.

NAUJOKAT (A.). — **Der Wiederaufbau der Elbe-
brücke bei Lauenburg.** (5 000 Wörter & Abb.)

1951 621 .13 & 691
Zeitsch. d. Vereins Deutsch. Eisenb. Ingenieure, Juni,
S. 72.

KIRSCH. — **Wirtschaftliches Oberflächenhärten von
Lokomotivteilen.** (4 000 Wörter & Abb.)

In English.

Modern Transport. (London.)

1951 656 .254 (42)
Modern Transport, March 10, p. 6.
New L. M. R. **signalbox.** (300 words & fig.)

1951 625 .23 (41)
Modern Transport, March 17, p. 13.
Irish railway coaches. (600 words & fig.)

1951 625 .23 (42)
Modern Transport, March 24, p. 3; March 31, p. 5.
Standard railway carriages. (2 200 words & fig.)

1951 621 .33 (42)
Modern Transport, March 31, p. 7.
Railway electrification. — Summary of B. T. C. report.
(1 300 words.)

1951 625 .232 (42)
Modern Transport, April 7, p. 10; August 25, p. 7.
Modern Railway carriages (XII). Electrified steam
lines (XIII). (1 400 words & fig.)

1951 621 .335 (42)
Modern Transport, April 21, p. 5.
New L. T. E. battery locomotives. (300 words & fig.)

1951 625 .617 (42)
Modern Transport, April 28, p. 7.
PICKFORD (A. C. B.). — Container traffic in Great
Britain. (1 600 words.)

1951 625 .617 (494)
Modern Transport, April 28, p. 11.
Containers at Zürich. (600 words & fig.)

1951 621 .132 .1 (42)
Modern Transport, May 5, p. 15.
Standard locomotives on British Railways. (1 200 words
& fig.)

1951 621 .132 .8 (42)
Modern Transport, May 19, p. 9.
POULTNEY (E. C.). — Modern high-powered
locomotives-4 (Concluded). (1 200 words.)

1951 625 .23 (41)
Modern Transport, May 26, p. 3.
New rolling stock in Ulster. (1 400 words & fig.)

1951 621 .131 .3 (42)
Modern Transport, May 26, p. 11.
Locomotive testing on British Railways. (1 500 words
& fig.)

1951 621 .431 .72 (42)
Modern Transport, June 2, p. 3.
Fell Diesel-mechanical locomotive. (2 300 words & fig.)

1951 625 .232 (42)
Modern Transport, June 9, p. 6.
New Golden Arrow train set. (1 800 words & fig.)

1951 621 .431 .72 (42)
Modern Transport, June 9, p. 11.
Diesel engines for rail traction. (1 200 words & fig.)

1951 656 .25 (42)
Modern Transport, June 30, p. 7.
Resignalling at York. (2 200 words & fig.)

The Proceedings of The Institution of Electrical Engineers. (London.)

1951 621 .332 (42)
The Proceedings of the Institution of Electrical Engineers,
June, p. 399.

WARDER (S. B.), FRIEDLANDER (E.) & ARMAN
(A. N.). — The influence of rectifier harmonics in a railway
system on the dielectric stability of 33 kV cables. (22 pages
with fig.)

Proceedings, Institution of Mechanical Engineers. (London.)

1950 62 (01 & 64)
Proceedings, Institution of Mechanical Engineers, Vol. 16
(W. E. P. No. 62.)

ANDERSON (C. G.). — Flexural stresses in curved
beams of I- and box-section. (8 000 words & fig.)

Railway Age. (New York.)

1951 625 .28 (7)
Railway Age, April 2, p. 59.

NEITHAMER (C. D.) & MARCH (T. J.). — Appa-
cation of motive power to railroad service. (2 400 words
tables & fig.)

1951 625 .142 .2 (7)
Railway Age, April 16, p. 42.
GRANT B. SHIPLEY. — Tie treatment and timber
preservation. (2 100 words & fig.)

1951 621 .431 .72 (7)
Railway Age, April 23, p. 26.
CANDEE (A. H.). — Service wrack of locomotive
electrical machinery. (Parts I & II). (4 800 words & fig.)

1951 621 .338 (7)
Railway Age, April, 30, p. 22.
WILLIAMSON (R. A.), KREITLER (F. C.)
O'KELLY (W. S.). — M.-U. cars with new four-motor
drives ride better and wear longer. (1 800 words & fig.)

1951 625 .24 (7)
Railway Age, May 7, p. 35.
No loose parts in Pullman-standard compartmentized
(600 words & fig.)

1951 385 (09)
Railway Age, May 14, p. 70.
What a century did to Erie locomotives and cars
(3 800 words & fig.)

1951 625 .25 (7)
Railway Age, May 21, p. 72.
WRIGHT (C. W.). — Nine basic car types proposed
in passenger car standardization program. (1 500 words
tables & fig.)

1951 656 .251 (7)
Railway Age, June 4, p. 47.
STALEY (J. R.). — Freight tariffs can and must be
simplified. (1 400 words.)

Railway Gazette. (London.)

1951 656 .22 (7)
Railway Gazette, February 23, p. 207.
GRANT (J. C.). — Improved method of train timetabling
analysis. (3 000 words & fig.)

- 1951** 621 .431 .72 (42)
 Railway Gazette, March 9, p. 270.
British Railways new main-line Diesel-electric locomotive. (1 200 words & fig.)
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- 1951** 625 .23 (42)
 Railway Gazette, March 16, p. 295.
British Railways standard coaches. (1 800 words & fig.)
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- 1951** 621 .33 (492)
 Railway Gazette, March 23, p. 327.
VAN DER HOEK (E.). — Electrification programme of the Netherlands Railways. (2 000 words & fig.)
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- 1951** 656 .254 (42)
 Railway Gazette, March 30, p. 350.
MOTT (J. E.). — Trains describers on the Southern region. (1 200 words & fig.)
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- 1951** 621 .132 .6 (68)
 Railway Gazette, March 30, p. 354.
Condensing tender for South African Railways. (600 words & fig.)
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- 1951** 621 .134 .1 (42)
 Railway Gazette, April 6, p. 377.
MORTON (I. S.) & VANDER ZIJDEN. — Carbocation in steam cylinders. (2 400 words & fig.)
-
- 1951** 656 .254 (42)
 Railway Gazette, April 13, p. 408.
Signalling of crossing stations in Pakistan. (1 200 words & fig.)
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- 1951** 621 .33 (42)
 Railway Gazette, April 20, p. 438.
Report on electrification of railways. (900 words & table.)
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- 1951** 625 .23 (54)
 Railway Gazette, April 27, p. 469; May 11, p. 528; May 25, p. 586; June 8, p. 642.
British modern lightweight coaches for Indian Railways. (1-2). (9 000 words & fig.)
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- 1951** 621 .132 .1 (42)
 Railway Gazette, May 4, p. 497.
British Railways class «5» standard locomotives. (900 words & fig.)
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- 1951** 625 .232 (42)
 Railway Gazette, May 4, p. 499.
Light-alloy rolling stock for London Transport. (3 000 words & fig.)
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- 1951** 624 .32 (73)
 Railway Gazette, May 11, p. 532.
New Cumberland river bridge S. R., U. S. A. (1 800 words & fig.)

- 1951** 621 .33 (42)
 Railway Gazette, May 18, p. 554.
Traction at the industrial frequency. (1 200 words & fig.)
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- 1951** 621 .335 (42)
 Railway Gazette, May 18, p. 557.
New London Transport battery locomotive. (600 words & fig.)
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- 1951** 625 .23 (494)
 Railway Gazette, May 18, p. 561.
Rubber-type coaches in Switzerland. (1 300 words & fig.)
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- 1951** 621 .131 .3 (42)
 Railway Gazette, May 25, p. 585.
Tests of the new « Britannia » class Pacifics. (1 300 words & fig.)
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- 1951** 625 .232 (59)
 Railway Gazette, June 1, p. 611.
Rolling stock for Malayan Railway. (2 000 words & fig.)
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- 1951** 621 .431 .72 (42)
 Railway Gazette, June 1, p. 615.
British Railways main-line Diesel-mechanical locomotive. (1 200 words & fig.)
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- 1951** 625 .232 (42)
 Railway Gazette, June 8, p. 639.
The new « Golden Arrow ». (2 000 words & fig.)
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- 1951** 621 .33 (44)
 Railway Gazette, June 15, p. 667; July 13, p. 37.
Electric traction by single-phase current at 50 cycles. (1-2.) (3 200 words.)

Diesel Railway Traction. (London.)

- 1950** 625 .28
 Diesel Railway Traction, February, p. 27.
Locomotive fuel costs compared. (1 800 words & tables.)
-
- 1950** 621 .438
 Diesel Railway Traction, February, p. 31.
Locomotive and gas turbine development. (2 000 words & fig.)
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- 1950** 621 .436 (73)
 Diesel Railway Traction, March, p. 62.
American railcar with hydraulic transmission. (1 400 words & fig.)
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- 1950** 621 .431 .72
 Diesel Railway Traction, April, p. 83.
Locomotive for high altitudes. (1 200 words & fig.)
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- 1950** 621 .431 .72 & 625 .28
 Diesel Railway Traction, April, p. 86.
KOFFMAN (J. L.). — Analysis of performance data (1 400 words & fig.)

1950 621 .431 .72 (41)
Diesel Railway Traction, June, p. 119.
Express Diesel train services for Ireland. (2 200 words & fig.)

1950 621 .438 (42)
Diesel Railway Traction, June, p. 125.
British Railways first gas-turbine locomotive. (2 400 words & fig.)

1950 625 .28
Diesel Railway Traction, June, p. 132.
KOFFMAN (J. L.). — Railcar bolster suspension. (2 500 words & fig.)

1950 621 .431 .72
Diesel Railway Traction, July, p. 141.
Gear-drive freight-transfer locomotive. (1 200 words & fig.)

1950 621 .431 .72 (44)
Diesel Railway Traction, August, p. 168.
Light standard railcars in France. (1 500 words & fig.)

1950 621 .431 .72 (45)
Diesel Railway Traction, August, p. 183.
Powerful Italian railcars. (600 words & fig.)

1950 621 .431 .72 (63)
Diesel Railway Traction, September, p. 191.
Freight locomotives for Abyssinia. (2 400 words & fig.)

1950 621 .431 .72 (436)
Diesel Railway Traction, September, p. 201.
Double-deck Diesel railcar. (300 words & fig.)

1950 625 .234
Diesel Railway Traction, September, p. 202.
Boilers for train heating. (1 000 words & fig.)

Railway Mechanical and Electrical Engineer. (New York.)

1950 621 .135 .5 (73)
Railway Mechanical and Electrical Engineer, August, p. 454.
SMITH (R. M.). — Locomotive wheel-slip and wheel lock protection. (2 000 words & fig.)

1950 625 .23 (73)
Railway Mechanical and Electrical Engineer, October, p. 580.
New York Central installing 100 air conditioned M. U. cars. (2 500 words & fig.)

1950 621 .431 .72 (73)
Railway Mechanical and Electrical Engineer, December p. 739.
DELANEY (J. P.) & GAUSS (H.). — Alco-G. E. dual purpose Diesel. (1 200 words & fig.)

In Spanish.

Revista de Obras Públicas. (Madrid.)
1951 62 (C)
Revista de Obras Públicas, junio, p. 253; julio, p. 315.
PAEZ BALACA (A.). — El coeficiente de seguridad (15 000 palabras.)

1951 624
Revista de Obras Públicas, septiembre, p. 415.
MENDIZABAL (D.). — Datos utilizados para posible estudio de una nueva instrucción para el cálculo de tramos metálicos. (7 000 palabras, cuadros & fig.)

Rutas. (Madrid.)

1951 621 .33 (46)
Rutas, nº 58, abril, p. 23.
La electricidad en el plan general de reconstrucción de los ferrocarriles españoles. (3 000 palabras & fig.)

In Italian.

Ingegneria ferroviaria. (Roma.)

1951 725 .31 (4)
Ingegneria ferroviaria, maggio, p. 341; giugno, p. 431.
FIENGA (R.). — La nuova stazione di Roma Termini. (25 000 parole & fig.)

1951 621 .131 .3 (4)
Ingegneria ferroviaria, maggio, p. 355; giugno, p. 455.
BOHL (G.). — Le prove delle locomotive presso Società Nazionale delle Ferrovie Francesi. (15 000 parole & fig.)

1951 621 .33 (4)
Ingegneria ferroviaria, giugno, p. 425.
ZATTONI (T.). — Stazioni comuni a linee elettrificate con diversi sistemi. (3 000 parole & fig.)

Rivista di Ingegneria. (Milano.)

1951 621 .44
Rivista di Ingegneria, maggio, p. 505; giugno, p. 621.
HERBRICH (W.). — Sugli sviluppi delle camere di combustione nelle turbine a gas. (8 000 parole & fig.)

1951 721
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DI BERARDINO (V.). — Notevoli semplificazioni nella lettura delle linee d'influenza degli archi. (1 200 parole & fig.)

1951 **388**
 Rivista di Ingegneria, agosto, p. 893.
 ANGELINI (I.). — *Trasporto di viaggiatori fra gli aeroporti ed il centro dei grandi agglomerati urbani.* (4000 parole.)

1951 **625 .42 (45)**
 Rivista di Ingegneria, settembre, p. 981.
 LUCCIO (G.). — *La metropolitana di Milano.* (8 000 parole & fig.)

In Netherlands.

Spoor- en Tramwegen. (Utrecht.)

1951 **656 .225 (492) & 656 .261 (492)**
 Spoor- en Tramwegen, n^r 15, 26 Juli, p. 245.
 GERST (F.). — *Het systeem en de organisatie van het Nederlandse laadkistenvervoer.* (3 500 woorden & fig.)

1951 **656 .222 .5**
 Spoor- en Tramwegen, n^r 16, 9 Augustus, p. 261.
 VAN LITH (F. J.). — *Onderzoek naar de wetmatigheid in het personenvervoer.* (2 500 woorden & fig.)

1951 **656 .225**
 Spoor- en Tramwegen, n^r 17, 23 Augustus, p. 279.
 PENTINGA (K. J.). — *Goederen vragen om bescherming.* (1 000 woorden & fig.)

1951 **625 .216 (4)**
 Spoor- en Tramwegen, n^r 17, 23 Augustus, p. 282.
 VAN DEN BROEK (W. R. G.). — *Automatische koppelingen voor het Europese rollend materieel.* (10 000 woorden.)

In Swedish (= 439.71).

Järnvägs-Teknik. (Stockholm.)

1951 **656 .256 .3 (485) = 439.71**
 Järnvägs-Teknik, No. 1, p. 2.
 LUNDBERG (T.). — *Coded track circuits and cab signals.* Trial installations on the Swedish State Railways. (3 400 words & fig.)

Nordisk Järnbanetidskrift. (Stockholm.)

1950 **624 .21 : 625 .1 (471) = 439.71**
 Nordisk Järnbanetidskrift, No. 11, p. 324.
 HELENELUND (K.). — *Lateral stresses in fixed girder bridges.* — (2 800 words.)

1950 **656 .24 (485) = 439.71**
 Nordisk Järnbanetidskrift, No. 11, p. 340.
 LINDBORG (O.). — *Compensation matters with regard to goods railway transports.* (1 100 words.)

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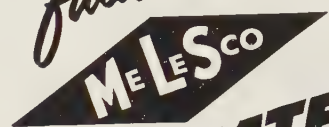
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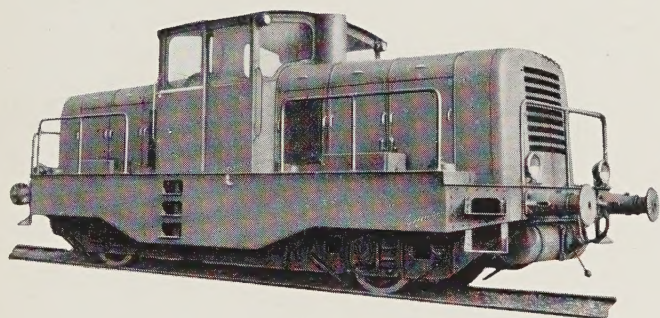
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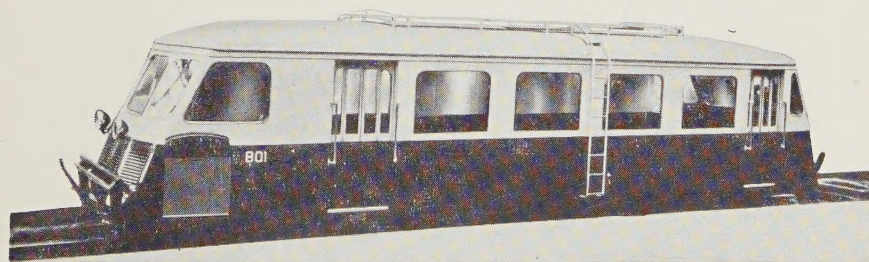
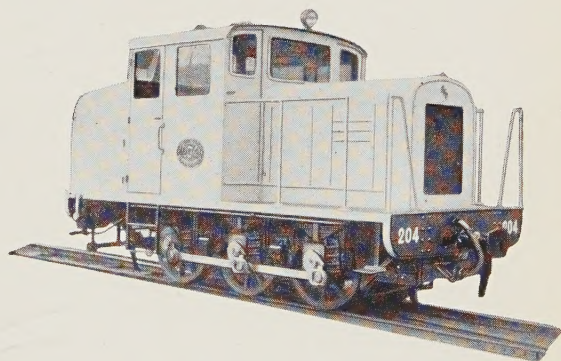
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